



architects + engineers

PROJECT MANUAL

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

**GEORGE WASHINGTON TOILET ROOM
RENOVATIONS**

**100 ORCHAD STREET
WHITE PLAINS, NEW YORK 10604**

SED Control #66-22-00-01-0-009-016

Project No: WPSD2007

CONTRACT G - GENERAL CONSTRUCTION, ASBESTOS
ABATEMENT, PLUMBING, HVAC & ELECTRICAL WORK

**FINAL BID DOCUMENTS
NOVEMBER 2021**

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
GEORGE WASHINGTON TOILET ROOM RENOVATIONS

SED Control No. 66-22-00-01-0-009-016

**CONTRACT G - GENERAL CONSTRUCTION, ASBESTOS ABATEMENT, PLUMBING, HVAC &
ELECTRICAL WORK**

FRONT END DOCUMENTS

00 0110	TABLE OF CONTENTS
00 1113	NOTICE TO BIDDERS
00 2113	INSTRUCTIONS FOR BIDDERS
00 2515	QUALIFICATIONS OF BIDDERS
00 4116	PROPOSAL FORM PA
00 4116.11	PROPOSAL FORM (PB -G)
00 4116.19	PROPOSAL FORM PC
00 43 57	INSURANCE CERTIFICATION
00 45 19	NON-COLLUSIVE FORM
00 45 21	HOLD HARMLESS AGREEMENT
00 45 47	IRAN DIVESTMENT ACT FORMS
00 45 50	SUB-CONTRACTORS LIST
00 72 00	GENERAL CONDITIONS
00 72 01	NYSED 155.5 REGULATIONS
00 73 43	PREVAILING WAGE RATES
00 73 44	WEEKLY PAYROLL FORM – WH347

SAMPLE AIA DOCUMENTS

AIA A310	(BID BOND)
AIA A312	(PERFORMANCE BOND)
AIA A312	(PAYMENT BOND)
AIA G702	(APPLICATION AND CERTIFICATE FOR PAYMENT)
AIA G703	(CONTINUATION SHEET)
AIA G704	(CERTIFICATE OF SUBSTANTIAL COMPLETION)
AIA G706	(CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS)
AIA G706A	(CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS)
AIA G707	(CONSENT OF SURETY TO FINAL PAYMENT)

TECHNICAL SPECIFICATIONS

DIVISION 1 – GENERAL REQUIREMENTS

011100	SUMMARY OF WORK
011400	WORK RESTRICTIONS
011419	SITE UTILIZATION PLAN
012100	ALLOWANCES
012300	ALTERNATES
012500	PRODUCT SUBSTITUTION PROCEDURES
012900	PAYMENT PROCEDURES
012973	SCHEDULE OF VALUES
013100	PROJECT MANAGEMENT AND COORDINATION

TABLE OF CONTENTS
 WHITE PLAINS CITY SCHOOL DISTRICT
 GEORGE WASHINGTON TOILET ROOM RENOVATIONS

013119	PROGRESS MEETINGS
013216	CONSTRUCTION SCHEDULE
013300	SUBMITTALS
014100	REGULATORY REQUIREMENTS
014223	SPECIFICATION FORMAT
014320	PRE-INSTALLATION MEETINGS
014500	QUALITY CONTROL
014500.01	STATEMENT OF SPECIAL INSPECTIONS AND TESTS
014536	ENVIRONMENTAL QUALITY CONTROL
015000	TEMPORARY FACILITIES AND CONTROLS
016100	BASIC PRODUCT REQUIREMENTS
016500	PRODUCT DELIVERY, STORAGE AND HANDLING
017329	CUTTING AND PATCHING
017423	CLEANING
017500	STARTING AND ADJUSTING
017800	CLOSEOUT SUBMITTALS
017823	OPERATING AND MAINTENANCE DATA
017839	PROJECT RECORD DOCUMENTS
017843	SPARE PARTS
017900	DEMONSTRATION AND TRAINING

DIVISION 2 – DEMOLITION

024119	SELECTIVE DEMOLITION
028100	ASBESTOS ABATEMENT
028333	INCIDENTAL LEAD

DIVISION 03 - CONCRETE

033000	CAST-IN PLACE CONCRETE
035400	CEMENTITIOUS UNDERLAYMENT

DIVISION 04 – MASONRY

040120	MAINTENANCE OF UNIT MASONRY
--------	-----------------------------

DIVISION 05 – METALS

055000	METAL FABRICATIONS
--------	--------------------

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

061000	ROUGH CARPENTRY
062000	FINISH CARPENTRY

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

078413	FIRESTOPPING
078446	FIRE-RESISTIVE JOINT SYSTEMS
079200	JOINT SEALANTS

DIVISION 08 – OPENINGS

081113	HOLLOW METAL DOORS AND FRAMES
081416	FLUSH WOOD DOORS

TABLE OF CONTENTS
WHITE PLAINS CITY SCHOOL DISTRICT
GEORGE WASHINGTON TOILET ROOM RENOVATIONS



081433	STILE RAIL WOOD DOORS
083113	ACCESS DOORS AND FRAMES
087100	FINISH HARDWARE
088000	GLAZING

DIVISION 09 – FINISHES

090120	PLASTER RESTORATION
092216	NON-STRUCTURAL METAL FRAMING
092900	GYPSUM BOARD
093013	CERAMIC TILING - THIN-SET
095113	ACOUSTICAL PANEL CEILINGS
099123	INTERIOR PAINTING

DIVISION 10 – SPECIALTIES

101423	SIGNAGE
102113.19	TOILET COMPARTMENTS-HDPE
102800	TOILET, BATH, AND LAUNDRY ACCESSORIES

DIVISION 12 – FURNISHINGS

123661.16	SOLID SURFACING COUNTERTOPS
-----------	-----------------------------

DIVISION 22 – PLUMBING

220516	EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING
220517	SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING
220523	GENERAL-DUTY VALVES FOR PLUMBING PIPING
220529	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
220553	IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
220719	PLUMBING PIPING INSULATION
221005	PLUMBING PIPING
221006	PLUMBING PIPING SPECIALTIES
224000	PLUMBING FIXTURES

DIVISION 23 – MECHANICAL REQUIREMENTS

230010	GENERAL MECHANICAL REQUIREMENTS
230015	MECHANICAL DEMOLITION
230135	HVAC SYSTEM CLEANING
230529	PIPE HANGERS AND SUPPORTS
230555	MECHANICAL SYSTEM IDENTIFICATION
230594	BALANCING OF AIR SYSTEMS
230700	PIPE INSULATION
230719	DUCTWORK INSULATION
230923	AUTOMATIC TEMPERATURE CONTROLS AND BUILDING AUTOMATION SYSTEM
230991	INSTRUMENTATION AND CONTROL INTEGRATION
230993	SEQUENCE OF OPERATIONS
232000	PIPE, VALVES AND FITTINGS
232003	THERMOMETERS AND PRESSURE GAUGES
232007	PIPING SPECIALTIES
232201	STEAM SPECIALTIES
232202	STEAM TRAPS
233113	SHEET METAL WORK
233416	EXHAUST FANS

TABLE OF CONTENTS
 WHITE PLAINS CITY SCHOOL DISTRICT
 GEORGE WASHINGTON TOILET ROOM RENOVATIONS

233713 DIFFUSERS, REGISTERS AND GRILLES
 238236 FINNED-TUBE RADIATION HEATERS

DIVISION 24 – 25

NOT USED

DIVISION 26 – ELECTRICAL

260505 SELECTIVE DEMOLITION FOR ELECTRICAL
 260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
 260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
 260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
 260533.13 CONDUIT FOR ELECTRICAL SYSTEMS
 260533.16 BOXES FOR ELECTRICAL SYSTEMS
 260533.23 SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS
 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
 260923 LIGHTING CONTROL DEVICES
 262726 WIRING DEVICES
 262816.16 ENCLOSED SWITCHES
 265100 INTERIOR LIGHTING

DIVISION 27 – 48

NOT USED

APPENDIX ‘A’

REPORT: “ENVIRONMENTAL INSPECTION SERVICES IN CONJUNCTION WITH THE FINAL ENVIRONMENTAL REPORT AT GEORGE WASHINGTON ES”

END OF TABLE OF CONTENTS

Notice is hereby given that **SEALED PROPOSALS** for:

WHITE PLAINS CITY SCHOOL DISTRICT

GEORGE WASHINGTON TOILET ROOM RENOVATIONS

SED Control No.: 66-22-00-01-0-009-016

**CONTRACT G - GENERAL CONSTRUCTION AND ASBESTOS ABATEMENT, HVAC, PLUMBING,
AND ELECTRICAL WORK**

will be received until **2:30 PM** on **12/03/2021** 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 **2:30 PM**, bids will be due at **2:30 PM** on the next day that the school district is open.

Complete sets of Hard Copy Bidding Documents, Drawings and Specifications, may be obtained beginning **11/03/2021**, from REVplans, 330 Route 17A, Suite #2, Goshen, New York 10924 Tel: 1-877-272-0216, upon depositing the sum 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. Plan deposit is refundable in accordance with the terms in the Instructions to Bidders to all submitting bids. Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs.

As a convenience to the Contractor digital Bidding Documents, Drawings and Specifications may be obtained from the following website: www.revplans.com as an online download for a nonrefundable fee of **Forty-Nine Dollars (\$49.00)**, in form of credit card.

Please note REVplans and www.revplans.com are the designated locations and means for distributing and obtaining all bid package information. All bidders are urged to register to ensure receipt of all necessary information, including bid addenda.

All bid addenda will be transmitted to registered plan holders via email and will be available at www.revplans.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 REVplans 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, **"GEORGE WASHINGTON TOILET ROOM RENOVATIONS, SED NO. 66-22-00-01-0-009-16"**. 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. In light of the COVID-19 pandemic and the related prohibitions on gatherings of individuals of any size for any reason, it is anticipated that in-person attendance

to the bid opening will not be permitted. If in-person attendance is not permitted at the bid opening, the bid opening will be recorded and streamed live online. If social distancing measures are still recommended by the CDC at the time of the bid opening, a website address to view the bid opening live will be provided in an addendum to the bid documents.

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 is scheduled for 3:45 PM on 11/15/2021 at the George Washington Elementary School, 100 Orchard Street, White Plains, New York 10604. Potential bidders are asked to gather at the main entrance at which time they will be escorted to the areas of work.

Bidders are asked to follow all CDC guidelines during the pre-bid walk thru. 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 WHITE PLAINS CITY SCHOOL DISTRICT (hereafter called School District), will receive **SEALED PROPOSALS** for:

**WHITE PLAINS CITY SCHOOL DISTRICT
GEORGE WASHINGTON TOILET ROOM RENOVATIONS
100 ORCHAD STREET WHITE PLAINS, NEW YORK 10604
SED: 66-22-00-01-0-009-016
CONTRACT G - GENERAL CONSTRUCTION WORK**

TIME AND PLACE

The sealed proposals are to be submitted at the:

**WHITE PLAINS CITY SCHOOL DISTRICT
Board of Education
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. Insurance Certification
- f. 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 bid must be accompanied by the Insurance Certification Form located in the specifications Failure to provide may result in the Owner finding the bidder "non-responsive" to the bid documents.

5. Single Prime Contractor - Sealed Subcontractor List: The within contract seeks bids from a single prime contractor. Each bidder shall submit with its bid a separate sealed list that names each subcontractor that the bidder will use to perform work on the contract, and the agreed-upon amount to be paid to each, for: (a) plumbing and gas fitting, (b) steam heating, hot water heating, ventilating and air conditioning apparatus and (c) electric wiring and standard illuminating fixtures. After the low bid is announced, the sealed list of subcontractors submitted with such low bid shall be opened and the names of such subcontractors shall be announced, and thereafter any change of subcontractor or agreed-upon amount to be paid to each shall require the approval of the school district, upon a showing presented to the school district of legitimate construction need for such change, which shall be open to public inspection. Legitimate construction need shall include, but not be limited to, a change in project specifications, a change in construction material costs, a change to subcontractor status as determined pursuant to paragraph (e) of subdivision two of section two hundred twenty-two of the labor law, or the subcontractor has become otherwise 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.

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 Owner'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 Owner'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 Owner 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 owner.
 - 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.
 4. Fully completed statement of bidder's qualification.
 5. Fully completed list of subcontractors.

Envelope No. 3 Single Prime Contractor - Sealed Subcontractor List:

The within contract seeks bids from a single prime contractor. Each bidder shall submit with its bid a separate sealed list that names each subcontractor that the bidder will use to perform work on the contract, and the agreed-upon amount to be paid to each, for: (a) plumbing and gas fitting, (b) steam heating, hot water heating, ventilating and air conditioning apparatus and (c) electric wiring and standard illuminating fixtures. After the low bid is announced, the sealed list of subcontractors submitted with such low bid shall be opened and the names of such subcontractors shall be announced, and thereafter any change of subcontractor or agreed-upon amount to be paid to each shall require the approval of the school district, upon a showing presented to the school district of legitimate construction need for such change, which shall be open to public inspection. Legitimate construction need shall include, but not be limited to, a change in project specifications, a change in construction material costs, a change to subcontractor status as determined pursuant to paragraph (e) of subdivision two of section two hundred twenty-two of the labor law, or the subcontractor has become otherwise 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. CONTRACT G shall submit with its 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:

- a. PLUMBING WORK
- b. HEATING, VENTILATION AND AIR-CONDITIONING WORK WORK
- 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.

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, LEED AP
Project Designer
H2M Architects + Engineers
2700 Westchester Ave, Suite 415
Purchase, NY 10577
Phone: 914.358.5623 x1323
Fax: 914.358.5624
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, LEED AP

Project Designer

H2M Architects + Engineers

2700 Westchester Ave, Suite 415

Purchase, NY 10577

Phone: 914.358.5623 x1323

Fax: 914.358.5624

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 District, the 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's, 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 contractor of award 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 received by the School District unless the bidder tendering same is known to be skilled in work of a similar nature to that envisaged in the Proposal.

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; and the amount it will accept in full payment.

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 Owner 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 there-from.

CONTRACTOR'S UNDERSTANDING

It is understood and agreed that the Contractor 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 this contract.

No official, officer or agent of the Owner is authorized to make any representations as to the materials or workmanship involved or the conditions to be encountered and the Contractor agrees that no such statement or the evidence of any documents or plans, not a part of this contract, shall constitute any grounds for claim as to conditions encountered. No verbal agreement or conversation with any officer, agent or employee of the Owner 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 Contractor 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 any other Contractor.

EQUIVALENTS

A. 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 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. Contractor 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 Owner and 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 Owner with all such additional information and data for this purpose as may be requested. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder fails to satisfy the Owner 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 Owner may request an extension in writing, if necessary, for bidders to hold their bid for an additional 45 days.

CONTRACTOR'S QUALIFICATION STATEMENT (POST BID)

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

Triton Construction, Inc.**Attn: Kevin Sawyer****130 East 33rd St - 11th Floor****New York, NY 10016****845-821-3354****Email: ksawyer@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.

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 Owner & Architect/Engineer and in accordance with the specifications annexed hereto and the plans referred to therein.

LABOR RATES

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.

Each Contractor 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 Contracts. 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:

- 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) whether or not any extensions of time were requested by the contractor and whether or not such requests were granted;
 - (iii) 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;
 - (iv) whether any liens were filed on the project by subcontractors or material suppliers of the bidder;
 - (v) whether the bidder was defaulted on the project by the owner;
 - (vi) 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.

STATEMENT OF BIDDER'S QUALIFICATIONS

1. Name of Bidder

2. Type of Business Party

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 the bidder's business.

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

6b. If the answer to number 6a is in the affirmative, list said persons and the names of their previous affiliations.

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

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

10. During the five year period preceding the submission of this bid, 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.

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

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

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

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 during the five years preceding the submission of this bid? If the answer to this question is yes, list the name of the individual convicted or indicted, the charge against the individual and the date of disposition of the charge.

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

16. Has the bidder bid on any projects for the period September 1, 2008 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.

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.

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

19. 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 for which the surety provided supervisory services.

Dated:

By: _____

(Signature)

(Print Name and Title)

Sworn to before me this

__ day of _____, 20_____

Notary Public

Contract G - General Construction and Asbestos Abatement Work

To: **WHITE PLAINS CITY SCHOOL DISTRICT**

5 Homese Lane

White Plains, NY 10605

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

Made this day of the month day of Month , 2021

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 G – GENERAL CONSTRUCTION, ASBESTOS ABATEMENT,
PLUMBING, HVAC & ELECTRICAL 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 2 – LEAD AND ASBESTOS REMOVAL

(written in words) _____ (\$)

ITEM 6 – DIVISION 3 – CONCRETE

(written in words) _____ (\$)

ITEM 7 – DIVISION 4 – MASONRY

(written in words) _____ (\$)

ITEM 8 – DIVISION 5 – METALS

(written in words) _____ (\$)

ITEM 9 – DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

(written in words) _____ (\$)

ITEM 10 – DIVISION 7 – THERMAL and MOISTURE PROTECTION

(written in words) _____ (\$)

ITEM 11 – DIVISION 8 – OPENINGS

(written in words) _____ (\$)

ITEM 12 – DIVISION 9 - FINISHES

(written in words) _____ (\$)

ITEM 13 – DIVISION 10 - SPECIALTIES

(written in words) _____ (\$)

ITEM 14 – DIVISION 11 - EQUIPMENT

(written in words) _____ (\$)

ITEM 15 – DIVISION 12 - FURNISHINGS

(written in words) _____ (\$)

ITEM 16 – DIVISION 22 - PLUMBING

(written in words) _____ (\$)

ITEM 17 – DIVISION 23 - HVAC

(written in words) _____ (\$)

ITEM 18 – DIVISION 26 - ELECTRICAL

(written in words) _____ (\$)

ITEM 19 – PROJECT CLOSEOUT

(written in words) _____ (\$)

ALLOWANCE G1 – ALLOWANCE FOR GENERAL CONTINGENCY

(written in words) Twenty Five Thousand Dollars and 00 Cents (\$25,000.00)

<p>TOTAL BASE BID (ITEMS 1 – 19 INCLUSIVE, PLUS ALLOWANCE G1) (written in words) _____ (\$)</p>
--

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
G1 (Add)	Builder's Risk Insurance: All costs associated with providing and purchasing a Builder's Risk Insurance Policy to include interest of the Owner and Contractor jointly in a form satisfactory to the owner. The limit must reflect the total completed value – all material and labor costs and provide coverage for fire, lightning, explosion, extended coverage, vandalism, malicious mischief, windstorm, hail and/or flood.	(\$)

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 FROM 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 – Saturday
WORK HOURS:	7:00 AM - 8:00 PM
CONSTRUCTION START DATE:	MONDAY, JUNE 27TH, 2022
SUBSTANTIAL COMPLETION:	FRIDAY, AUGUST 19TH, 2022
FINAL COMPLETION:	FRIDAY, SEPTEMBER 2ND, 2022

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):

<u>ADDENDUM NO.</u>	<u>DATED</u>
_____	_____
_____	_____

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 I have 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:

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

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

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

3. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit 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/her 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 be required 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 contractor or 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: _____

LIST OF SUBCONTRACTORS

List of Subcontractors

The Bidder shall list the subcontractors, if any, to be used for this project. Provide the required information for each proposed subcontractor. Make appropriate copies of this form should the Bidder propose more than five (5) subcontractors. List at least five projects for each subcontractor that demonstrates the subcontractor's qualifications to perform the work of the project. The projects shall be similar size and complexity and have been completed within the last five (5) years by the subcontractor.

(NOTE THIS FORM MUST BE COMPLETED BY BIDDER AND INCLUDED IN ENVELOPE MARKED QUALIFICATIONS)

Subcontractor Name: _____

Type of Work: _____

<u>Owner</u>	<u>Contact Name</u>	<u>Phone Number</u>	<u>Location</u>	<u>Contract Amount</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

LIST OF SUBCONTRACTORS

Subcontractor Name: _____

Type of Work: _____

<u>Owner</u>	<u>Contact Name</u>	<u>Phone Number</u>	<u>Location</u>	<u>Contract Amount</u>

Subcontractor Name: _____

Type of Work: _____

<u>Owner</u>	<u>Contact Name</u>	<u>Phone Number</u>	<u>Location</u>	<u>Contract Amount</u>

AGREEMENT
WHITE PLAINS CITY SCHOOL DISTRICT
TOILET ROOM RENOVATIONS AT GEORGE WASHINGTON ELEMENTARY SCHOOL

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

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)

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.

AGREEMENT
WHITE PLAINS CITY SCHOOL DISTRICT
TOILET ROOM RENOVATION AT GEORGE WASHINGTON ELEMENTARY SCHOOL

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 Contract 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

ARTICLE 1 - DEFINITIONS 1

ARTICLE 2 – CONTRACTOR’S REPRESENTATIONS..... 3

ARTICLE 3 – CONTRACTOR’S CONSTRUCTION PROCEDURES 5

ARTICLE 4 – CONTRACTOR’S USE OF SITE 12

ARTICLE 5 – SUBCONTRACTORS 20

ARTICLE 6 – CONTRACTOR’S USE OF DRAWINGS/SPECIFICATIONS 22

ARTICLE 7 – CONTRACTOR’S SAFETY/SECURITY PROGRAM..... 33

ARTICLE 8 – CHANGES IN THE WORK..... 39

ARTICLE 9 – PAYMENTS..... 42

ARTICLE 10 – INSURANCE REQUIREMENTS..... 50

ARTICLE 11 – REQUIRED BONDS FOR THE PROJECT..... 53

ARTICLE 12 – INDEMNIFICATION..... 54

ARTICLE 13 – TIME FOR COMPLETION OF WORK..... 56

ARTICLE 14 – DEFICIENT AND INCOMPLETE WORK..... 59

ARTICLE 15 – FINAL COMPLETION AND CLOSEOUT OF THE PROJECT..... 61

ARTICLE 16 – RELEVANT STATUTORY PROVISIONS 63

ARTICLE 17 – TERMINATION OR SUSPENSION..... 67

ARTICLE 18 – CLAIMS AND DISPUTES..... 71

ARTICLE 19 – MISCELLANEOUS PROVISIONS 72

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 with 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 occupied 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 contaminants 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 radius, 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 of 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.

2. 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.

S. 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.

T. 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.

U. 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.

V. 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.

W. 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.

X. 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 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.

Y. 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.

<REMAINDER OF PAGE LEFT BLANK INTENTIONALLY>

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:

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

2. Commercial General and Umbrella Liability

Coverage	Occurrence using ISO occurrence Form CG 00 01 07 98 or later form
Limits per project	General Aggregate - \$2,000,000.00 Products - Completed/Operations - \$1,000,000.00 Personal & Advertising Injury - \$1,000,000.00 Fire Damage (any one fire) - \$50,000.00 Medical Expenses (any one person) - \$10,000.00 Umbrella - \$10,000,000.00

3. Automobile Liability (all vehicles hired or non hired) \$1,000,000.00 per accident

4. If this project requires the removal of asbestos and/or hazardous materials, Contractors shall provide hazardous material liability insurance as follows:

\$1,000,000 per occurrence/\$2,000,000 aggregate, including products and completed operations. Such insurance shall include coverage for the Contractor's operations including, but not limited to, removal, replacement enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with any related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs. If a retroactive date is used, it shall pre-date the inception of the Contract. If motor vehicles are used for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage (ISO endorsement CA 9948) 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 District of the Certificate of Completion.

5. 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 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.

Coverages 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.

B. The insurance required to be procured by the Contractor pursuant to paragraph A of this Article 10 shall be purchased from and maintained by an insurance carrier licensed to do business in the State of New York, with an A.M. Best rating of "secured" or better. 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.

C. 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.

D. All insurance coverage to be provided by the Contractor shall name the Owner, the Construction Manager and the Architect as additional insureds on the policy. 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 coverage for the Contractor's work.

E. In the event that any of the insurance coverage to be provided by the Contractor to the Owner contains a deductible, 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, which deductible shall in all circumstances remain the sole obligation and expense of the Contractor.

F. 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.

G. The Contractor shall require all subcontractors to carry similar insurance coverages and limits of liability as set forth in paragraph A of this Article 10 and adjusted to the nature of subcontractors' operations and submit same to the Owner for approval prior to start of any work. In the event the Contractor fails to obtain the required certificates of insurance from the Subcontractor 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.

H. 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 the Contractor or Subcontractors leased or hired by them and any policy of insurance covering the Contractor or Subcontractors against physical loss or damage to such property shall include an endorsement waiving the right of subrogation against the Owner for any loss or damage to such property.

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

K. 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.

L. 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.

M. 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 himself, 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 States mail addressed to the authorized representative of the party to be notified; (2) by depositing the same in the United States 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 use 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 contaminants 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# 2021003444

<https://apps.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1512088>

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**

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.

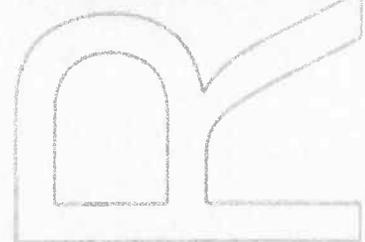
If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

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 « », « »

(Witness)

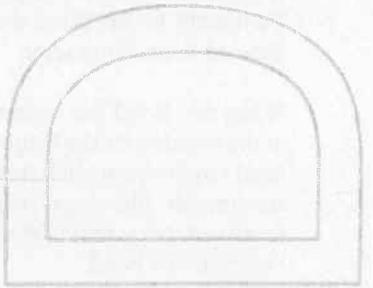
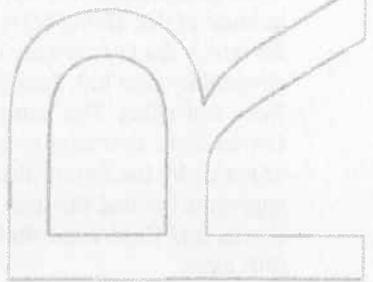
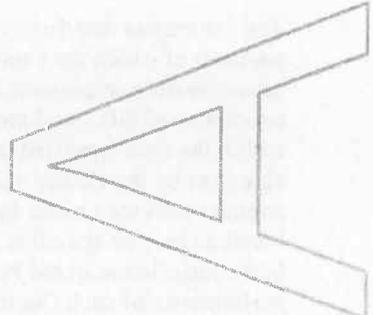
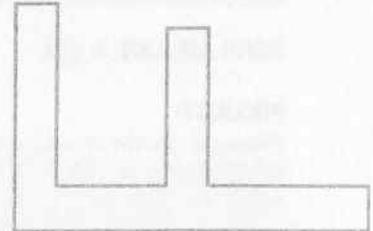
(Witness)

« » _____
(Contractor as Principal) (Seal)

« » _____
(Title)

« » _____
(Surety) (Seal)

« » _____
(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
Company: (Corporate Seal)

SURETY
Company: (Corporate Seal)

Signature: _____
Name and « »« »
Title:

Signature: _____
Name and « »« »
Title:

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

« »
« »
« »

OWNER'S REPRESENTATIVE:

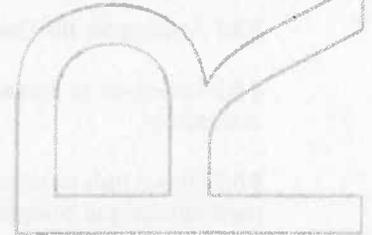
(Architect, Engineer or other party:)

« »
« »
« »
« »
« »
« »

ADDITIONS AND DELETIONS:
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.

§ 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

Company:

(Corporate Seal)

Signature:

Name and Title: « »« »

Address: « »

SURETY

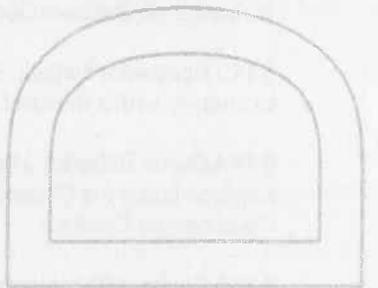
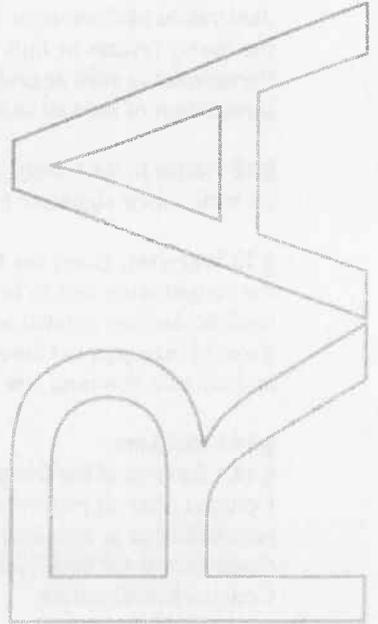
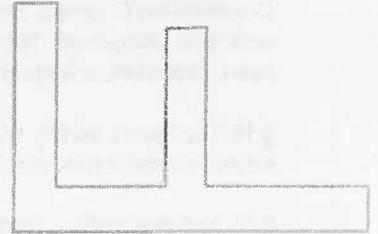
Company:

(Corporate Seal)

Signature:

Name and Title: « »« »

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

Company: (Corporate Seal)

SURETY

Company: (Corporate Seal)

Signature: _____

Name and « »« »

Title:

(Any additional signatures appear on the last page of this Payment Bond.)

Signature: _____

Name and « »« »

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

« »
« »
« »

OWNER'S REPRESENTATIVE:

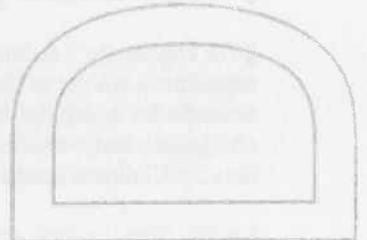
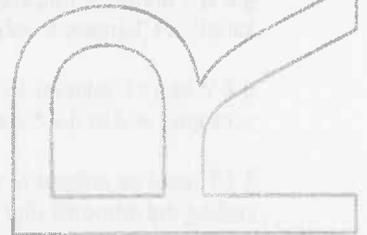
(Architect, Engineer or other party:)

« »
« »
« »
« »
« »
« »

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.

§ 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

Company: _____ (Corporate Seal)

Signature: _____
Name and Title: « »« »
Address: « »

SURETY

Company: _____ (Corporate Seal)

Signature: _____
Name and Title: « »« »
Address: « »

Application and Certificate for Payment

TO OWNER: PROJECT: PWA APPLICATION NO: 001 Distribution to: OWNER: [] ARCHITECT: [] CONTRACTOR: [] FIELD: []

PERIOD TO: General Construction CONTRACT FOR: 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
 - b. 0 % of Stored Material (Column F on G703) = \$0.00

- Total Retainage (Lines 5a + 5b or Total in Column I of G703)..... \$0.00
- 6. TOTAL EARNED LESS RETAINAGE..... \$0.00 (Line 4 Less Line 5 Total)
- 7. LESS PREVIOUS CERTIFICATES FOR PAYMENT..... \$0.00 (Line 6 from prior Certificate)
- 8. CURRENT PAYMENT DUE..... \$0.00
- 9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)..... \$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.)

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

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.

AIA Document G702™ - 1992. Copyright © 1953, 1963, 1965, 1971, 1978, 1983 and 1992 by The American Institute of Architects. All rights reserved. This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 08:57:13 on 01/16/2012 under Order No. 1836019481_1 which expires on 12/17/2012, and is not for resale.

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

ARCHITECT'S PROJECT NUMBER:

TO OWNER: *(Name and address)*

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

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

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).

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

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:

DRAFT AIA Document G707™ - 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)*
PWA

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR: General Construction

TO OWNER: *(Name and address)*

CONTRACT DATED:

OWNER:

ARCHITECT:

CONTRACTOR:

SURETY:

OTHER:

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

on bond of
(Insert name and address of 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)

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.)

Attest:
(Seal):

(Surety)

(Signature of authorized representative)

(Printed name and title)

PART 1 - GENERAL

1.01 BRIEF PURPOSE OF PROJECT / GENERAL

- A. The purpose of the project is to renovate existing student bathrooms including but not limited to new fixtures, bathroom stalls, accessories, lighting, ventilation, heating, plumbing and finishes.
- B. All work shown and specified in the Contract Documents shall be the work of this Construction Contract. The Owner does not anticipate awarding other prime contracts for the project as shown.
- C. This Section provides an abbreviated summary of the work for the Construction Contract associated with the Owner's program to construct the project.
- D. 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 terms "Contractor" and/or "Prime Contractor" where used shall refer to the individual or company who has entered into an agreement with the Owner to perform the work contained within these Contract Documents. The lack of word capitalization shall be incidental.
- C. The General Construction Contractor may be referred to as the "General Contractor", "Prime General Contractor", "Contract G Contractor" or similar wording. The lack of word capitalization shall be incidental. This Construction Contract shall be known as Contract G.
- 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.

1.03 ABBREVIATED SUMMARY OF CONTRACT G 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/Engineer, 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. The project scope involves to renovating existing student bathrooms including but not limited to new fixtures, bathroom stalls, accessories, lighting, ventilation, heating and finishes.
 - 2. Asbestos Abatement work as indicated within the Contract Documents.
 - 3. Project closeout submittals.
- D. All other work shown and specified within the Contract Documents for Contract G.

1.04 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. Local laws and ordinances of Westchester County and New York State. _____
 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.

1.05 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. Site utilization and management so as not to disrupt the Owner's ability to operate the existing facilities in a safe and efficient manner.
 3. Maintain the Owner's ability to operate the facility at all times during the construction period.
 4. 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.
 5. Product and equipment storage and handling requirements.
 6. Starting and adjusting of the equipment and systems required under the project.
 7. Site safety in accordance with all applicable federal, state, and local regulations.
 8. Project submittals, meeting/testing services/work plans/schedule/Shop drawings/closeout procedures and documents/manuals/as-built drawings/final commissioning of the work shall be provided as required by the Contract.
 9. Provide and maintain, at all times, temporary roadways for site access to all parties involved with the project.
 10. Temporary facilities and controls necessary to construct the project and to maintain permit levels of sewage treatment at all time.
 11. Site utilization and management so as to allow other prime contractors to perform work in conjunction with this project and to afford them equal opportunity and space to complete their contractual obligations with the Owner as solely defined by the Architect/Engineer.
 12. To not hinder the Owner's ability to deliver a safe and potable water supply.
 13. To not hinder the Owner's ability to maintain permit levels of sewage treatment at all times.
- B. The Owner has or will award other construction contracts associated with this project.
- C. It is anticipated that work of all the contracts will coincide with work of this Contract.

1.06 OWNER SUPPLIED PRODUCTS AND UTILITIES

- A. The Owner will not be supplying equipment, labor, or tools for the project.
- B. The Owner will pay for electricity usage. The restrictions on electrical usage shall be as follows:
1. Power tool usage during specified working hours will only be permitted.
 2. Dewatering and trash pumps and portable heaters will not be permitted.
 3. Sump pumps, if less than 1/3 horsepower will be allowed. Only two (2) sump pumps will be permitted to operate at the same time.
 4. Power to help cure concrete or painting systems will not be permitted.

- C. The Owner reserves the right to stop paying for electrical usage at any time if, in the opinion of the Owner/Architect/Engineer, the Contractor causes excessive electrical charges or does not conserve electricity to the maximum extent possible in the opinion of the Architect/Engineer. All Contractors shall conserve electricity during the course of construction.

1.07 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/Engineer 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/Engineer of the obstructions' existence.
- D. The Architect/Engineer 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

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.
- E. Contract requirements related to maintaining Owner's current operations and excess inspection required.

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.

- I. The Contractor shall not close any road for any period in time unless approved ahead of time by appropriate road agency. The Contractor shall take whatever measures are necessary to not cause any inconvenience to the area's residents.
- J. The 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.
- K. Contractor shall be responsible for protecting private 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 the Architect/Engineer or District. Contractor shall protect all of the physical structures, property and improvements 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.
- L. Keep all existing driveways, roads, and parking areas free and clear of materials and equipment. Do not unreasonably encumber the work area with materials and equipment.
- M. 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.
- N. Do not discard or dispose of any waste on-site.
- O. 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 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/Engineer'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 provide temporary handrails, as required, for their work or for work put in place by their Contract that will require temporary handrails. Construction of temporary handrails shall be as specified in Section 015000.
- E. 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.
- F. 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.
- G. Keep all existing operations areas, driveways, roads, and parking areas free and clear of materials and equipment. Do not unreasonably encumber the site with materials and equipment. Confine stockpiling of excess excavated material, materials and equipment to areas selected under the Site Utilization Plan or as designated by the Owner's construction representative. Locate storage sheds and trailers to areas designated in the plan or by the Owner's Construction Representative.
- H. Immediately remove excess excavated material or relocate to areas on the site requiring placement of fill. Do not stockpile excess material on the site.
- I. 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.
- J. 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.
- K. 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.
- L. 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.
- M. 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.
- N. Refer to Section 015000 - Temporary Facilities and Controls for minimum rubbish removal requirements.

- O. Do not discard or dispose of any waste on-site.
- P. Open fires will not be permitted on the site.
- Q. 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.
- R. Install erosion control measures as indicated in the Contract. The Contractor shall confine stormwater runoff to the site.
- S. The General Contractor shall be responsible for managing dust as specified in Section 015719.

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.
- 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 Contractor will be permitted to schedule working days and hours as specified in the General Terms and Conditions.
- 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. Employees shall not converse with local residents or Owner's employees.
- E. Any employee found under the influence of any drug or alcohol will be banned from the site.
- F. The Contractor 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.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 011400

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Site Utilization Plan requirements

1.02 SITE UTILIZATION PLAN REQUIREMENTS

- A. The 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/Engineer 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. The 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. The 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/Engineer 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/Engineer.
- 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 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/Engineer 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/Engineer will consider requests for substitutions only within **two (2)** business days following the Bid Opening.*
- C. Only products not specifically named in the bid are eligible for substitution in accordance with the requirements contained herein these specifications.
- D. 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/Engineer for those products named in the bid.

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/Engineer.
- 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 material suppliers and vendors.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Shall reimburse the Owner for review or redesign services associated with re-approval by authorities, if required.
 - 6. Shall reimburse the Owner for all additional A/E services needed by the Architect/Engineer for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Architect/Engineer's professional engineering services agreement. Reimbursement shall be based on the man-hours expended, at current billing rates.

- 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/Engineer 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.
- I. **Refer to the general conditions for additional requirements.**

PART 3 - EXECUTION

NOT USED

This space left intentionally blank.

REQUEST FOR SUBSTITUTION FORM

Project: GEORGE WASHINGTON TOILET ROOM RENOVATIONS Substitution Request Number: _____

Contractor: _____

Address: _____

To: _____ Date: _____

H2M Project Number: WPSD 2007 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/Engineer 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/Engineer for extra services associated with the review of the Contractor's substituted item since it could not have been originally included in the Architect/Engineer'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/Engineer 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/Engineer 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/Engineer. Any prior punch lists, which include "major" or significant items, as defined by the Architect/Engineer, 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/Engineer 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/Engineer 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/Engineer 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/Engineer.
 - 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 Progress 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 three (3) 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/Engineer 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/Engineer 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/Engineer reserves the right to revise the form or provide a form prepared by the Architect/Engineer.
- 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/Engineer.
- 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/Engineer.
- E. List quantities of materials specified under unit price allowances.
- F. The Schedule of Values, after approval by the Architect/Engineer, 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/Engineer:
 - 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/Engineer.

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 other Contractors, utility companies, and the Owner/Architect/Engineer
 - 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/Engineer will respond to requests utilizing the form provided herein.
- C. A signed facsimile of the form will be accepted. The original of the form must be signed and provided to the project manager.
- D. The Architect/Engineer 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/Engineer 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/Engineer 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/Engineer'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/Engineer 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/Engineer 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/Engineer 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/Engineer 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/Engineer, 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. The Contractor shall sequence and schedule the work of subcontractors. Coordinate construction and administration activities of subcontractors. The Architect/Engineer 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/Engineer by the Contractor.

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.

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 CONTRACTOR'S JOB SITE SUPERINTENDENT

- A. The Contractor shall employ an on-site superintendent as specified herein below. He/She shall be a full-time employee of the Contractor.
- B. The Contractor shall name the job site superintendent within five (5) days of the Notice To Proceed. A letter to the Architect/Engineer 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. The Superintendent shall have a minimum of five (5) years of experience as a job site superintendent for projects of equal size and complexity.
- E. The superintendent shall be qualified to perform the duties so required to successfully complete the work in accordance with the Contract Documents.
- F. The superintendent shall speak English. If required by the Architect/Engineer, 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/Engineer to determine the proposed superintendent's ability to properly coordinate the work through the Owner/Architect/Engineer. The Contractor shall employ a superintendent acceptable to the Owner.

THIS SPACE LEFT INTENTIONALLY BLANK.

REQUEST FOR INTERPRETATION/INFORMATION (RFI)

OWNER'S NAME: WHITE PLAINS CITY SCHOOL DISTRICT

PROJECT NAME & CONTRACT DESIGNATION: GEORGE WASHINGTON TOILET ROOM
RENOVATIONS

CONSTRUCTION CONTRACT NO.: WPSD 2007

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/Engineer Response:	
Architect/Engineer (Printed):	See Architect/Engineer's Attachments for Additional Information
Architect/Engineer's Signature & Date	<i>Response Accepted By Contractor Contractor's Signature & Date</i>
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/Engineer.	

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 013100

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. Each 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. 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 bi-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 contractor's 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 OTHER MEETINGS

- A. Attend special meetings which may be required or called for by Federal, State or Local authorities, utility companies, Owner, Architect/Engineer or any other firm, person or organization related to the project.

1.08 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.
- B. Prepare a Gantt Chart type schedule and keep it up to date as specified hereinafter.
- C. All schedules shall be submitted in accordance with the requirements contained herein in Section 013300.
- D. Refer to Section 013100 regarding the requirements for attendance at Project Coordination Meetings and additional requirements concerning the submission of other project coordination and sequencing information.

1.02 SCHEDULE PREPARATION MILESTONE DATES & REQUIREMENTS

- A. Each Contractor shall prepare Draft #1 Construction Schedule for presentation and discussion during Project Coordination Meeting No. 1.
 - 1. The Architect/Engineer will provide at least seven (7) calendar days written notice regarding the date of the first meeting.
 - 2. At the Architect/Engineer's discretion, Project Coordination Meeting No. 1 may immediately take place on the same date and directly following the Pre-Construction Conference. The Notice To Proceed will contain information regarding the Pre-Construction Conference and Project Coordination Meeting No. 1 should it be so decided by the Architect/Engineer.
 - 3. Draft #1 Construction Schedule shall be prepared as specified hereinafter.
 - a. The schedule shall show all the major and subordinate tasks necessary to complete the project in the specified time and interim milestones.
 - b. It shall allow adequate time for other Prime Contractors to complete their related work as best estimated by the Contractor. It being understood that the Contractor's allotted time for others to perform their work is non-binding and does not relieve the Contractor from completing all the work in the specified contract completion time in accordance with the Contract Documents. It also being understood that this is the Contractor's realistic best estimate of the time needed for others to complete their related work.
 - c. The schedule shall also show the dependencies and time allocated for each task.
 - 4. The date, place, and time for Project Coordination Meeting No. 2 shall be established at the first meeting, but in no case be more than ten (10) calendar days from the date of the first meeting.
- B. As a result of the first meeting, a better understanding of each Contractor's time requirements will have been achieved. Within five (5) working days of the date of *Project Coordination Meeting No. 1*, each Contractor shall prepare Draft #2 Construction Schedule and submit it to the Architect/Engineer and each other Prime Contractor for review. Each Contractor shall mail his/her schedule to all parties via Overnight Mail with a Return Receipt Requested.
 - 1. *Project Coordination Meeting No. 2* shall be attended by all Prime Contractors for the purpose of jointly developing a Combined Construction Schedule. The meeting shall focus on the time needed to complete each task and subordinate task and for establishing task dependencies.
 - 2. The date, place, and time for *Project Coordination Meeting No. 3* shall be established at the meeting.

1.03 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/Engineer 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.

1.04 CONSTRUCTION SCHEDULE - GANTT CHART TYPE

- A. The schedule shall 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.
- B. Prepare the schedule in a manner so that the actual progress of the work can be recorded and compared with the expected progress.
- C. The schedule shall show the following:
 - 1. Task links/task dependency in blue ink.
 - 2. Work under the Contract in green ink.
 - 3. Milestone dates (zero duration) by a red diamond.
 - 4. The end date for each task and subtask at the end of a bar.
 - 5. The description of all major tasks within the bar. The bar shall be red.
 - 6. Critical path.

1.05 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.

1.06 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).

1.07 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.

1.08 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.

1.09 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/Engineer 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.

1.10 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.

1.11 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

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/Engineer will not review project submissions until such time as the form is completed 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/Engineer 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/Engineer.
- E. Every submittal shall also be accompanied by a Transmittal Letter (or "Speed Form") addressed to the Architect/Engineer'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/Engineer 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/Engineer'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/Engineer. H2M architects + 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 architects + 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 architects + 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/Engineer's office as follows:
 - H2M architects + engineers
 - 2700 Westchester Avenue, Suite 415, Purchase, NY 10577

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/Engineer'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/Engineer'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/Engineer 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/Engineer 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/Engineer and has been found in general to be in compliance with the Contract Documents. The notations made on the submittal by the Architect/Engineer 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/Engineer 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/Engineer's comments and resubmitted to the Architect/Engineer 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/Engineer 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/Engineer 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/Engineer,
 3. has been made and stamped "Make Corrections Noted", but contractor has not complied with Architect/Engineer'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/Engineer, which did not appear on the previous submissions.

1.12 CONTRACTOR'S RESPONSIBILITIES

- A. Architect/Engineer'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/Engineer 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/Engineer 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/Engineer 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/Engineer 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/Engineer. The Architect/Engineer 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/Engineer 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/Engineer.
- 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. All Technical Submittals.

1.18 SAMPLES

- A. Where required, or where requested by the Architect/Engineer, 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/Engineer, 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/Engineer 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/Engineer.
- 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/Engineer'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/Engineer 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 in 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/Engineer 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/Engineer 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/Engineer 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/Engineer'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: GEORGE WASHINGTON TOILET ROOM RENOVATIONS

H2M PROJECT NO.: WPSD 2007

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:	<i>Name</i>	() <i>Tel. no.</i>	<i>Email</i>
Supplier's Name:			
Supplier's Mailing Address:			
Supplier's Contact Information:	<i>Name</i>	() <i>Tel. no.</i>	<i>Email</i>
This item is a substitution for the specified item:	<input type="checkbox"/> No	<input type="checkbox"/> Yes	
Contractor's Approval Stamp with Signature & Date	<u>Contractor's Brief Comments or Remarks</u> (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

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. Clearing and tree removal
 - 2. Transportation and disposal of construction debris

3. Building permits that are required by the municipality where the work is located. Arrange for inspections of the work by the municipal building department before closing in the installed work, if so required. Work will not be accepted for payment until such inspections are performed and accepted by the building department.
4. Electrical Service
5. Telephone Service
6. Electrical Inspector's Incorporated, Certificate for Electrical Installation or preapproved electrical inspection agency

1.05 NOISE CONTROL

- A. Control noise in accordance with City 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.

1.10 COORDINATION WITH GAS UTILITY COMPANY

- A. Comply with the gas utility company requirements including inspection for the incoming gas service.

1.11 COORDINATION WITH WATER UTILITY

- A. Comply with the water utility requirements for water and fire service connections. Obtain and pay for all necessary permits from the water utility. Obtain authority to connect to the existing water mains.

1.12 COORDINATION WITH SANITARY SEWER UTILITY

- A. Comply with the public utility requirements for the connection of sanitary sewer lines to the public utility services. Obtain and pay for all necessary permits from public sewer department. Obtain authority to connect to their existing sanitary sewers.

1.13 COORDINATION WITH TELEPHONE UTILITY COMPANY

- A. Comply with the utility company requirements for the incoming telephone service.

1.14 UTILITY WORK WITHIN STATE HIGHWAY RIGHT-OF-WAY

- A. Utility Work, either overhead or underground, within the boundaries of the state highway right-of-way, shall conform with procedures set forth in the Department of Transportation publications "Department Rules and Regulations Governing the Accommodation of Utilities Within State Highway Right-of-Way (Part 131 - Title 17 Transportation) and "Issuance of Highway Work Permits" (Code 7.12-2).

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 014100

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

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/Engineer 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/Engineer.

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/Engineer 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/Engineer 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/Engineer.
- 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/Engineer 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/Engineer 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/Engineer 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/Engineer 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/Engineer's request, uncover any work, which has been buried or covered, and perform special tests designated by Architect/Engineer. If the work cannot be tested by other means, Architect/Engineer 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/Engineer. 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/Engineer.
 - 2. Concrete flatwork: As directed by the Architect/Engineer.
 - 3. Pavement subgrade: As directed by the Architect/Engineer.

- 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/Engineer. This requirement shall be subject to change as required by the Architect/Engineer.

1.10 FIELD OBSERVATION OF CONTRACTOR'S WORK

- A. The Architect/Engineer 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/Engineer. Conduct field sampling and testing in the presence of Architect/Engineer. 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 WHITE PLAINS CITY SCHOOL DISTRICT School		Building George Washington Elementary	
Project Title GEORGE WASHINGTON TOILET ROOM RENOVATIONS			
SED Project # 66-22-00-01-0-010-016		Project Address 7 NOSBAND AVENUE, WHITE PLAINS, NEW YORK 10604	
Architect/Engineer H2M architects + engineers			
Name of Person Completing this Statement Guy Page, R.A.		Phone 631-756-8000	Date 12/17/2020
Comments N/A			

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	C O N T I N U O U S	P E R I O D I C	REFERENCE STANDARD	B R C E N F Y E S R E N C E	C R H E E Q C U K I R I E F D	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)	C O N T I N U O U S	P E R I O D I C	REFERENCE STANDARD	B R C E N F Y E S R E N C E	C R H E E Q C U K I R I E F D	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)	C O N T I N U O U S	P E R I O D I C	REFERENCE STANDARD		B R C E N F Y E S R E N C E	C R H E Q U I R I E F D	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.		X	ACI 318: 26.10.2			x	033000
11. Inspect formwork for shape, location and dimensions of the concrete member being formed		X	ACI 318: 26.10.1(b)				
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)	C O N T I N U O U S	P E R I O D I C	REFERENCE STANDARD		B R C E N F Y E S R E N C E	C R H E Q U I R I E D	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)	C O N T I N U O U S	P E R I O D I C	REFERENCE STANDARD	B R C E N F Y E S R E N C E	C R H E Q C U K I R I E F D	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 diaphragms 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)	C O N T I N U O U S	P E R I O D I C	REFERENCE STANDARD	B R C E N F Y E S R E N C E	C R H E Q C U K I R I E F D	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)	C O N T I N U O U S	P E R I O D I C	REFERENCE STANDARD	B R C E N F Y E S R E N C E	C R H E Q C U K I R I E F D	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 RELATED SECTIONS

- A. Section 014100 - Regulatory Requirements
- B. Section 015719 - Temporary Environmental Controls

1.03 ASBESTOS AND LEAD-BASED PAINT CERTIFICATION

- A. Contractor shall submit the enclosed "Asbestos and Lead-Based Paint Certification" upon completion of all work.

1.04 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/Engineer, 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/Engineer immediately. The Owner and Architect/Engineer 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/Engineer.
 - 2. No person shall be allowed back into the affected area without permission of the Owner.

1.05 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

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/ANSI 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 NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
 - 1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test The temporary utility before use. Obtain required certifications and permits.

1.03 PROJECT CONDITIONS

- A. Temporary Utilities: The contractor will prepare a schedule indicating dates for implementation and termination of The 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. The Contractor is responsible for the following:
 - 1. Installation, operation, maintenance and removal of The 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 The 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 "015001 - Uniform Safety Standards for School Construction."
 - 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. Provide materials suitable for use intended.
- B. Lumber and Plywood:
1. For job-built temporary offices, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.
 2. For signs and directory boards: provide exterior 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 representatives, and necessary 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 NFPA 10 and NFPA 241 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. The 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 The contractor's field office, all articles for First Aid treatment. The 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 (NFPA 70). 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 The 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 The floor level, spaced so that a 50-foot extension cord can rThe The work area. Provide separate 110-120 Volt, 20 Amp circuit for The 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 The 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 The 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 The 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 The 1000 sq. ft. of area.
3. Stairways: Provide one 200 watt lamp per landing at The 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 The 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 Staging Area 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 The 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. The 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. The 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, The 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. The 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. The 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. The 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. The 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. The 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. The 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 The 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. The 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 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. The 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 The 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. The 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 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 The 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. The 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 The 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. 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/Engineer may check all or any portion of the work and the Contractor shall afford all necessary assistance to the Architect/Engineer in carrying out such checks.
 - 1. Such checking by the Architect/Engineer 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/Engineer 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/Engineer, 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/Engineer 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/Engineer 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/Engineer.

2.02 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.

2.03 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/Engineer.
- 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/Engineer 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/Engineer 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, disfigurements 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/Engineer, no work shall be covered until it has been observed, tested, photographed, measured, and authorized to be covered by Architect/Engineer.
- 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/Engineer's direction to uncover the work if tie distances were not obtained.
- C. If any work has been covered with Architect/Engineer's consent and Architect/Engineer considers it necessary or advisable that covered work be observed or tested, the Contractor, at Architect/Engineer's request, shall uncover, expose or otherwise make available for observation, or testing as Architect/Engineer 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/Engineer 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/Engineer.
 - 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/Engineer in writing. The Architect/Engineer will investigate the accusations and make a determination. The Architect/Engineer's determination shall be binding and agreed to by both parties.
- I. If the Architect/Engineer'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/Engineer 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

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/Engineer 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 and utilities.
- 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/Engineer 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/Engineer present during the start-up.
 - 3. The deduction shall be equal to the Architect/Engineer'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.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017500

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Submit the following documents to the Architect/Engineer 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/Engineer 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 - 100% of contract including change orders
 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/Engineer'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/Engineer, 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/Engineer 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. Each manual shall contain the following as a minimum:
 - 1. Table of contents
 - 2. Final version of the warranty statement approved by the Architect/Engineer
 - 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.
- I. 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.
- J. 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/Engineer 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. This copy of the manual will be retained on the site until such time as the final, updated manual is provided.
- K. 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 - ALTERNATES for requirements related to updating the manual(s).
- L. 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/Engineer 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/Engineer, 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/Engineer 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/Engineer. 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/Engineer 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/Engineer 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/Engineer.
- 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/Engineer.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017839

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/Engineer 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/Engineer'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/Engineer.
 - 4. The Owner/Architect/Engineer 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

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.
- F. Where manufacturer services are specified for control panel or control center startup, the representative shall be experienced and trained to work on and field rewire such devices.
 - 1. Field representatives for control panel startup shall understand the control sequence specified and, in the case of programmable logic controllers, are able to make revisions to the factory program using handheld programming devices or laptop computers.
 - 2. The Owner will not pay for time spent in the field to correct a PLC programming problem.
- G. Submit manufacturers' startup reports (MSR's) in accordance with the requirements contained in Section 013300 - Submittals.

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/Engineer.
- B. The service visits shall be scheduled at least 2 weeks in advance so that the Owner and Architect/Engineer 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/Engineer.
 - 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.
- I. For control panels, explain the control sequence, timing structure, and safety precautions when working inside the panel, terminal wiring system, PLC program, if applicable, operator interface(s) and control logic.
- J. Explain PLC LED input and output numbering system, if applicable. If control relays are used, explain technique for their replacement.

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 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.
- 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

SECTION 02081
ASBESTOS ABATEMENT

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. The asbestos abatement contractor shall perform the following work as described below and indicated on the drawings. The drawings are only a diagrammatic representation of the Work Areas and do not constitute the actual quantities of material. Asbestos abatement contractor is responsible for the confirmation of the actual total quantities of the Work. The Asbestos Contractor shall provide all labor, equipment and materials complete for performance of the Work in accordance with the Contract Documents. All asbestos material is to be disposed of as asbestos-containing material (ACM) waste. Quantities indicted below are confirmed asbestos.

GEORGE WASHINGTON ELEMENTARY SCHOOL

100 Orchard Street, White Plains, NY 10604

1. Drawing H002.00: 2nd Floor Partial Plan

- a. Remove and dispose of asbestos-Containing Pipe Insulation (Grey) within **Work Area 1** utilizing New York State Department of Labor (NYS DOL) Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York (12 NYCRR Part 56) §7.11 (ii) Tent Procedures.
- b. Remove and dispose of asbestos-Containing Pipe Insulation (Grey) within **Work Area 2** utilizing New York State Department of Labor (NYS DOL) 12 NYCRR Part 56 §7.11 (ii) Tent Procedures.

Work Area #	Location	Asbestos-Containing Material	Approximate Quantity	Removal Procedure
1	2 nd Floor Girls Toilet 215	Pipe Insulation (Grey) - Concealed in Chase	55 LF	NYS DOL 12 NYCRR Part 56 § 7.11 (ii) Tent Procedures
2	2 nd Floor Boys Toilet 219	Pipe Insulation (Grey) - Concealed in Chase	58 LF	NYS DOL 12 NYCRR Part 56 § 7.11 (ii) Tent Procedures

2. Drawing H003.00: 3rd Floor Partial Plan

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- a. Remove and dispose of asbestos-Containing Pipe Insulation (Grey) within **Work Area 3** utilizing New York State Department of Labor NYS DOL 12 NYCRR Part 56 §7.11 (ii) Tent Procedures.
- b. Remove and dispose of asbestos- Pipe Insulation (Grey) within **Work Area 4** utilizing New York State Department of Labor NYS DOL 12 NYCRR Part 56 §7.11 (ii) Tent Procedures.

Work Area #	Location	Asbestos-Containing Material	Approximate Quantity	Removal Procedure
3	3 rd Floor Girls Toilet 315	Pipe Insulation (Grey) - Concealed in Chase	55 LF	NYS DOL 12 NYCRR Part 56 § 7.11 (ii) Tent Procedures
4	3 rd Floor Boys Toilet 321	Pipe Insulation (Grey) - Concealed in Chase	57 LF	NYS DOL 12 NYCRR Part 56 § 7.11 (ii) Tent Procedures

- B. The Contractor is responsible for completing all notifications and variances required to meet the determined start date (if applicable).
- C. If asbestos containments are required, the Contractor shall establish the asbestos containments so as to not interfere with operation of or access to the temporary equipment that shall be installed by others.
- D. The Contractor shall field verify the amount of ACM and familiarize him/her-self with all variable field conditions in the building before the submission of his/her quote. The quantities presented in this specification are approximate only and should not be used solely as the basis for any quote. Any discrepancies or difference in the approximate and actual quantities shall be resolved before the award of any Contract. No change order relative to ACM material quantity will be permitted after the award of the Contract. In the event that suspect materials not included in this Specification are encountered while the work is in progress, such material shall be tested and, if confirmed ACM, removed as ACM, in accordance with the procedures contained herein. The discovery of any new material(s) should not delay the progress of the work as contained in this specification. Payment for any additional work will be considered on a case-by- case basis by the Environmental Consultant and White Plains City School District (CSD). It is the responsibility of the Contractor to determine and negotiate the full cost of any such payment prior to performance of any additional work.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- E. ACM shall be properly handled, packaged, and transported for disposal in a landfill in accordance with all Federal, State and Local regulations. After September 4, 2006, the Contractor shall follow Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York (Cited as 12 NYCRR Part 56) as amended effective March 21, 2007. All related manifests and shipping logs shall be provided to White Plains CSD upon or before the end of the project.
- F. All work shall be accomplished in strict adherence to the project Specification, applicable Federal, State, and Local Regulations. Whenever there is a conflict or overlap of the above references, the more stringent provision shall apply.
- G. The Contractor's industrial hygiene practices during asbestos abatement will be monitored by White Plains CSD's Environmental Consultant. The Contractor shall be responsible for monitoring his/her own construction safety work practices for compliance with the Occupational Safety and Health Administration (OSHA) regulations.
- H. The Asbestos Contractor shall provide the best available technology, and state-of-the-art procedures and methods of execution, clean-up, disposal, and safety.
- I. The Contractor will be required, if approved by White Plains CSD and/or its Representative, to obtain at his/her own expense appropriate variances from regulatory agencies as required to complete the safe removal of asbestos-containing material as described in this specification.
- J. White Plains CSD's environmental consultant will sample all suspect materials that may be identified during the course of demolition, if applicable. The Contractor shall provide access to the consultant to perform the testing and no additional costs will be paid for the time it takes to perform the testing. The contractor shall provide itemized cost proposal to White Plains CSD which must include separate costs for the abatement of the individual materials revealed to be ACM (if applicable). Additional asbestos-containing materials shall not be abated without written authorization from White Plains CSD or environmental consultant. The contractor will not be compensated for any additional materials that can be encountered during the abatement project, without prior written authorization from White Plains CSD or environmental consultant.

1.2 PHASING OF WORK: This work shall include asbestos abatement associated with upcoming interior, exterior and roof upgrades project. The Asbestos Contractor shall perform and complete the abatement of asbestos-containing materials during regular working hours, Monday through Friday between 8:00 am and 4:00 pm or as directed by the facility. It is the Contractor's responsibility to ensure that acceptable visual inspection and air monitoring results are obtained with fiber count of <70 Structures/mm² of air using Asbestos Hazard Emergency Response Act (AHERA) analysis method (40 CFR 763 APX a No. III) and are completed prior to the return of building occupants or other trades. All work shall be coordinated with White Plains CSD and White Plains CSD's Environmental Consultant prior to start of any work. The White Plains CSD's Environmental Consultant shall be present whenever any asbestos abatement work is

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

being conducted.

1.3 AUTHORITY TO STOP WORK: White Plains CSD and the Environmental Consultant shall have the authority to stop the abatement work at any time the contractor's work is not in conformance with the Specifications and applicable regulations. The stoppage of work shall continue until conditions have been corrected to the satisfaction of White Plains CSD and the Environmental Consultant. Standby time to resolve the problems shall be at the contractor's expense.

1.4 SITE REQUIREMENTS:

- A. Noise Control: Provide mufflers or other acceptable means of noise reduction for all equipment to be used by the Contractor. Observe local laws regarding noise control.
- B. Wastewater: All water used by the Contractor during asbestos abatement activities shall be collected and passed through a water filtration system capable of filtering particles down to 5 microns prior to being discharged into the sanitary sewer. The Contractor shall contact the Westchester County engineering department to determine the acceptable location(s) to access the sanitary sewer. The Contractor shall be responsible for connection to the sanitary sewer, and for providing piping, pumps, water filtration systems, and other items necessary to collect, transport, filter, and dispose of the wastewater.
- C. Log In/Out: The Asbestos Contractor must ensure all workers log in and out daily at the site.
- D. The location of the Decontamination Unit shall be as per abatement design drawings. All variations must be coordinated and approved by the site manager and White Plains CSD's Environmental Consultant.

1.5 HEALTH AND SAFETY:

- A. Toxic Effects: The Contractor shall assume all responsibility for any toxic effects to workers from the air supplied to respirators, or from toxic or damaging vapors or residues resulting from the use of encapsulant and/or wetting agents or other substances used by the Contractor during construction.
- B. Chemical/Biological Hazards: The known chemical/biological hazards on site include asbestos-containing material and debris. The Contractor shall provide materials, equipment and training to its workers to ensure their protection from these and any other chemical/biological hazards which may be identified during the course of this work.
- C. Physical Hazards: The Contractor shall provide safety equipment and training to his/her workers to ensure their protection from any physical hazards including but not limited to trip/fall hazards, working at elevation, heat stress, contact with energized (hot) active equipment, noise, overhead bump hazards, and electrical

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

shock that may be present during the Work.

- D. Safety Act: The Occupational and Safety Health Act (OSHA) of 1970, as amended, shall be strictly complied with during the course of this project. This Act shall govern the conduct of the Contractor's workmen, tradesmen, material-men, and subcontractors, and visitors to the project site.
- E. Accident Prevention: In order to protect the lives and health of his/her employees, the Contractor shall comply with all pertinent provisions of the latest edition of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc. and shall maintain an accurate record of all accidents which occur during the project. Any injury or loss of life must be immediately reported by the Contractor to the White Plains CSD and/or its Representatives, and a copy of the Contractor's report to his/her insurer of an accident must be provided to the White Plains CSD and/or its Representatives.
- F. Emergency Response: The Contractor shall establish an Emergency Response Team made up of members of his/her work force. Team members shall be trained, organized, and capable of responding in the event of an accident, fire, or other emergency. The Contractor shall designate a site Safety Coordinator to train team members regarding the location and use of site-specific fire/life safety equipment. As a minimum requirement, members of the Emergency Response Team shall be knowledgeable in standard first aid and CPR techniques, fire extinguisher use, and evacuation procedures.
- G. Workmen Protection: The Contractor shall provide and maintain all safety measures necessary to properly protect workmen.
- H. Emergency Actions: In an emergency affecting the safety of life, the work, or adjoining property, the Contractor, to prevent such threatened loss or injury without special instruction or authorization from the White Plains CSD and/or its Representatives, is hereby permitted to act at his/her discretion.
- I. Hazard Communication Act: The Contractor shall comply with the Hazard Communication Standard promulgated by the Occupational Safety and Health Administration (OSHA No. 29 CFR 1910.1200). This program ensures that all employers provide the information they need to inform and train employees properly and to design and put in place employee protection program. It also provides necessary hazard information to employees so they can participate in, and support, the protective measures needed at their workplace. The contractor shall ensure that labels or other forms of warning are legible in English. Employer having employees who speak other languages must add the information in their languages. See OSHA 29 CFR 1910.1200 for more details.

1.6 WORK SUPERVISION AND COORDINATION:

- A. Abatement Contractor's Supervisor: From the start of work through to the project completion the Contractor shall have on-site a responsible and competent supervisor who possesses a valid New York State Department of Labor

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

(NYS DOL) Supervisor certifications. As a minimum, the Asbestos Contractor's Supervisor shall meet the qualifications as required by Article 1.12, for a job supervisor. The Supervisor shall be on site during all working hours. When the Supervisor must leave site during work, a temporary Supervisor shall be appointed.

- B. Quality of Work: The Supervisor shall supervise, inspect and direct the Work competently and efficiently, devoting such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. The Supervisor shall be responsible to see that Work complies accurately with the Contract Documents, and that all Work installed is of good quality and workmanship.

1.7 SUBMITTALS: Unless otherwise noted the Contractor shall submit three (3) copies of each APPLICABLE submittal to the White Plains CSD's Environmental Consultant and its Representatives for review and/or approval. The Contractor shall provide the following:

A. Pre-Project Submittal:

1. Certificates of Insurance naming White Plains Central School District as an additionally insured party.
2. All required bonds. All bonds shall be underwritten by a United States based, preferably New York State, A or B rated bonding company.
3. List of Subcontractors.
4. Health and Safety Plan: Provide a written Health and Safety Plan addressing procedures for workplace safety. At a minimum, the following topics shall be addressed in the plan:
 - a. Hazard Communication. Procedure on how physical and health hazards associated with the work are identified and communicated to employees, and name of the person responsible for implementation of the Hazard Communication Program.
 - b. Guidelines for assessment and prevention of heat stress.
 - c. Procedures for using ladders safely.
 - d. Electrical safety procedures.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- e. Emergency Action Plan: The Contractor shall submit for review a written Emergency Action Plan. This Plan shall outline the contingency actions to be performed for emergencies including fire, accident, power failure, supplied air system failure, breach of work area containment, unexpected asbestos contamination in the site area and on the adjoining grounds, or spilling of asbestos material being hauled to storage and/or disposal. This Plan shall identify the manner in which emergencies are announced, emergency escape procedures and routes, and procedures to account for all employees after evacuation. The Plan shall identify those persons responsible for fire/life safety duties including the Site Safety Coordinator, persons responsible for fire prevention equipment and the control of fuel source hazards, and the members of the Emergency Response Team (see Paragraph "Emergency Response" of this Section). This Plan shall be readily available for review by all workers.
 - f. Fall Protection Plan: The Contractor shall submit for review a written Fall Protection Plan. This plan shall outline the actions to be performed to protect personnel when they are working at elevation. The plan shall detail specific fall protection devices and/or protocols to be utilized, training provided to personnel for same and training of designated competent person in charge of and responsible for the elevated work site.
- 5. Proof of written notifications required by Paragraph "Codes, Permits and Standards" of this Section. Proof that all required permits and variances have been obtained.
 - 6. Proof of written notification to the local police department, fire department and Facility (include a copy of required by NYS DOL ICR 56 section 56-3.6a ten-day notice) that asbestos abatement work is being conducted. As a minimum, the notification letter shall include the address of the Facility, dates work is to be performed, and drawings indicating the areas to undergo abatement.
 - 7. Documentation of compliance with all requirements of paragraph "Requirements and Qualifications" of this Section. Submittal shall include:
 - a. Proof that the job supervisors, foremen, and asbestos abatement workers meet State certification and license requirements.
 - b. Proof of a current medical surveillance program for all Contractor's personnel to work on this project.
 - c. Completed and notarized Certificate of Worker's Release for each asbestos abatement worker, workers of other trades, or supervisory personnel who enter the work area or otherwise contact ACM.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

8. Proof of a respiratory protection program. Submit level of respiratory protection intended for each operation required by the project.
 9. Proof of historic airborne fiber data. Submit airborne asbestos fiber monitoring data from an independent air monitoring firm to substantiate selection of respiratory protection proposed. Data shall include the following for each procedure required by the work: 1. date of measurement; 2. type of work task monitored; 3. methods used for sample collection and analysis, and; 4. number, duration and results of samples taken.
 10. Proof that a landfill site has been located, and arrangements for transport and disposal of asbestos-containing or asbestos-contaminated materials have been made. Provide the name and location of the landfill, and waste transport company, if applicable.
 11. Manufacturer's literature on all proposed job-related equipment and products to be used on this project. Include Safety Data Sheets (SDS) for encapsulant, fire retardant plastics, mastic remover and other chemicals to be used on this project.
 12. A detailed Asbestos Removal and Disposal Work Plan which describes all aspects of the work to be performed for this project. The Plan shall include the following:
 - a. A detailed description of the work area enclosure. Provide shop drawings (with dimensions and locations) of proposed decontamination facilities and work areas. These drawings shall indicate the following: 1) areas to be sealed off and work area boundaries; and 2) proposed layout and location of the decontamination enclosure systems. Include a detailed description of any modifications or changes to be made to the specified negative pressure work area enclosure.
 - b. Specimen of the daily log proposed for use. Minimally, the log should include the date(s) and time(s) when all personnel enter and leave the work area(s).
- B. During Work Submittal:
1. Schedule of Work Changes: Any changes in the Schedule of Work proposed by the Contractor shall be submitted for approval to White Plains CSD no later than seven days prior to the commencement date of the proposed change. A revised Schedule shall be submitted at the end of each week.
 2. Notarized copy of payroll showing that prevailing wage rates have been paid shall be submitted to the White Plains CSD on a weekly basis. Contractor shall use DOL form for wage payment.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

3. A "Request For Services" form shall be submitted at least 24 hours in advance of required air monitoring tests and inspections to be performed by the White Plains CSD's Environmental Consultant.
4. Results of all air monitoring performed by the Contractor shall be posted within 24 hours for regular abatement project after collection for all workers to see. A copy of the results shall be given to the White Plains CSD's Environmental Consultant at the same time.
5. A certified, signed, and completed copy of each "Waste Shipment Record" form used, and receipts from the landfill operator which acknowledge the Contractor's delivery(s) of material, shall be submitted to the Consultant and Engineer within thirty days following removal of ACM from building.
6. A copy of the bound logbook.

C. Post Project Submittal:

1. A notarized "Release of Liens" in a form acceptable to the White Plains CSD. Use the standard American Institute of Architects (AIA) form A101. Such notarized release of all liens shall certify that all subcontractors, labor suppliers, etc., have been paid their pro rate share of all payments to date, that the contractor has no basis for further claim, and will not make further claim for payment in any account after the first payment is made to him.
2. Proof of payment of prevailing wage rate to direct employees and subcontractor.
3. Notarized copies of a daily log showing the date(s) and time(s) of entrance to and exit from the work area(s) for all persons.
4. Compilation in chronological order of all air monitoring records pertaining to this project.
5. Compilation of all completed and signed Waste Shipment Record forms, bills of lading, or disposal receipts pertaining to this project.
6. Copies of notifications and checks to applicable agencies (see Subparagraph "Pre-Project Submittal Information" of this Section) that the asbestos abatement project has been completed.
7. Contractor shall submit the following items as part of his final submittals: Paid invoice verifications for sub-contractor (for Time and Material job), service contract agreement, insurance certificates, copies of the workers licenses (NYS DOL), and other submittal required for the Specification.

1.8 FIRE PROTECTION AND EMERGENCY EGRESS: The Contractor shall be responsible

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

to the security and safeguarding of all areas turned over by the facility to the Contractor. The Contractor shall designate to his/her workers and other building occupants a means of egress in case of emergency.

- A. The Contractor shall establish emergency and fire exits from the work area. First aid kit, 2 full sets of protective clothing and respirators shall be provided for use by qualified emergency personnel in the clean room of the decontamination facility.
- B. For full containment only, the Contractor shall provide a secure work area to protect against unauthorized entry into and around the work area. Any hazardous conditions shall be reported to the contractor's Supervisor and the contractor shall correct the hazard immediately. Any intrusion or incident shall be documented in a bound logbook which shall be maintained at the project site.

1.9 CLEAN-UP:

- A. Asbestos Related Clean-up: All clean-up work related to asbestos abatement work shall be in strict accordance with general technical requirements and this specification.
- B. Final Site Cleaning: Upon completion of the work, the Contractor shall remove all temporary construction, decontamination facilities, and unused materials placed on site by the Contractor; put the premises in a neat and clean condition; and provide all sweeping, cleaning, and washing required to restore the site to its original condition.

1.10 CODES, PERMITS, AND STANDARDS:

- A. The Contractor shall be solely responsible for compliance with all applicable federal, state (12 NYCRR Part 56 Adopted March 21, 2007), and local laws, ordinances, codes, rules, and regulations which govern asbestos abatement work or hauling and disposal of asbestos waste material. The current issue of each document shall govern. All work shall comply with all applicable codes and regulations as amended including: EPA Title 40CFR, Part 763, OSHA Title 29CFR, part 1910(including sections 1001,134,1926.2 and 1926.1200); EPA Title 40 CRF Part 61; NYSDEC Title 6, Part 364 and NYSDOH Title 10, Part 73
- B. Before starting the work, the Contractor shall examine the Technical Specification for compliance with codes and regulations applicable to the work and shall immediately report any discrepancy to the White Plains CSD's Environmental Consultant.
- C. Where conflict among requirements or with these Specifications exists, the more stringent requirements shall apply.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- D. Permits, State Licenses, and Notifications: The Contractor shall be responsible for obtaining necessary permits, variances, state licenses, and certifications of personnel in conjunction with asbestos removal, hauling, and disposition and shall provide timely notification of such actions as may be required by federal, state, regional, and local authorities. Fees and/or charges for these licenses, permits, and notifications shall be paid by the Contractor. Contractor shall use all notification forms where applicable.
- 1. Agency Notification: At least 10 days prior to commencement of any asbestos removal, the Contractor shall prepare written notification to EPA Region 2, to the New York State Department of Labor (NYSDOL), and all other applicable agencies having jurisdiction. In addition, the Contractor shall be required to obtain any other permits for work covered under this specification including permits required for air sampling.

1.11 TERMINOLOGY: The following commonly used terms are defined in the context of these Specifications:

- A. Asbestos Project: Work that involves the removal, encapsulation, enclosure, repair or disturbance of friable or non-friable asbestos, or any handling of asbestos material that may result in the release of asbestos fibers. For the purpose of compliance with this part, an asbestos project shall include any disturbance of asbestos fibers, and the planning, asbestos survey (as per Subpart 56-5.1), design, background air sampling, inspection, air sampling and oversight of abatement work, cleanup, and the handling of all asbestos material subject to abatement, as well as the supervising of such activities. Installation of friable ACM shall also be considered an asbestos project. An asbestos project starts with Phase I when the planning, asbestos survey, and design work begins or is required to begin.
- B. Asbestos-Containing Material (ACM): Any material or product which contains more than 1 percent asbestos.
- C. Aggressive Air Sampling: Air monitoring samples collected while a leaf blower, fans, or other such devices are used to generate air turbulence within the work area.
- D. Air Filtration Device (AFD) - A portable local exhaust system equipped with High-efficiency particulate air (HEPA) filtration, capable of maintaining a constant low velocity air flow into contaminated areas from adjacent, uncontaminated areas and capable of maintaining a negative air pressure with respect to the adjacent, uncontaminated areas.
- E. Air Lock: A system for permitting ingress or egress to the work area while permitting minimal air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways placed a minimum of three feet apart.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- F. Air Monitoring: The process of measuring the fiber content of a specific volume of air in a stated period of time. Personal air sampling results shall be calculated to reflect the employee's eight-hour time weighted average (TWA) exposure. Area sampling results are reported directly, without calculating the TWA.
- G. Amended Water: Water to which a surfactant has been added.
- H. Asbestos Removal Encapsulant: A chemical solution used in place of amended water during asbestos removal to penetrate, bind, and encapsulate the asbestos-containing material.
- I. Authorized Visitor: White Plains CSD's Environmental Consultant or representatives of any regulatory or other agency having jurisdiction over the project.
- J. White Plains CSD's Environmental Consultant: White Plains CSD's agent who is authorized to exercise general contract administration and industrial hygiene inspection of the work.
- K. Certified Industrial Hygienist (CIH): One certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.
- L. Class II asbestos work: Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic. Class I asbestos work includes the removal of thermal system or surfacing materials.
- M. Competent Person: Definition and responsibilities as set down in 29 CFR 1926.1101(b) and as outlined herein.
- N. Curtained Doorway: A device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms.
- O. Decontamination Enclosure System: A series of connected rooms for the decontamination of workers (a Personnel Decontamination Enclosure System) or of materials and equipment (Equipment Decontamination Enclosure System).
- P. Equipment Decontamination Enclosure System: A decontamination system for waste materials and equipment, typically consisting of a designated area of the work area, a washroom, and a holding area, with an air lock between any two adjacent rooms and a curtained doorway between the holding area and the non-work area. Not to be used for personnel entry/exit.
- Q. Encapsulant (Sealant): A liquid material which can be applied to ACM and which controls the possible release of asbestos fibers from the material, either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- R. Encapsulation: Application of an encapsulant to asbestos-containing building materials to control the possible release of asbestos fibers into the ambient air.
- S. Enclosure: Procedures necessary to completely enclose ACM behind air-tight, impermeable, permanent barriers.
- T. Excursion Limit (EL): The EL is an airborne concentration of asbestos to which no employee shall be exposed when not using respiratory protection. The EL is 1.0 fibers per cubic centimeter (f/cc) as averaged over a 30-minute period.
- U. Fixed Object: A unit of equipment or furniture in the work area which cannot be removed from the work area.
- V. Friable: Any material which, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure, or is capable of being released into the air by hand pressure.
- W. Full Facepiece High Efficiency Respirator (FFHER): A respirator which covers the wearer's entire face from the hairline to below the chin and which is equipped with a HEPA filter.
- X. Half Mask High Efficiency Respirator (HMHER): A respirator which covers one-half of the wearer's face, from the bridge of the nose to below the chin and is equipped with HEPA filters.
- Y. HEPA Filter: A high efficiency particulate air (HEPA) filter capable of trapping and retaining 99.97 percent of the fibers of 0.3 micrometer or larger in diameter.
- Z. HEPA Vacuum Equipment: High efficiency particulate air (HEPA) filtered vacuuming equipment having a UL 586 filter system capable of collecting and retaining asbestos fibers.
- AA. Large Asbestos Project: Large asbestos project shall mean an asbestos project involving the disturbance, enclosure, encapsulation, repair or handling of 160 square feet or more of ACM, Presumed Asbestos-Containing Material (PACM) or asbestos material or 260 linear feet or more of ACM, PACM or asbestos material.
- AB. Lockdown: Procedure of applying an encapsulant as a protective coating or sealant to a surface from which ACM has been removed in order to control and minimize airborne asbestos fiber generation that might result from residual asbestos-containing debris.
- AC. Minor Asbestos Project: Minor project shall mean an asbestos project involving the disturbance, enclosure, encapsulation, repair or handling of 10 square feet or less of ACM, PACM or asbestos material or 25 linear feet or less of ACM, PACM or asbestos material.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- AD. Movable Object: A unit of equipment or furniture which can be removed from the work area.
- AE. Plasticize: To cover floors and walls with plastic sheeting as herein specified.
- AF. PE: Professional Engineer.
- AG. Permissible Exposure Limit (PEL): The PEL is an airborne concentration of ACM to which no employee shall be exposed when not using respiratory protection. The OSHA PEL is 0.1 f/cc expressed on an 8-hour time weighted average (TWA).
- AH. Personnel Decontamination Enclosure System: A decontamination system for personnel and limited equipment, typically consisting of an equipment room, shower room, and clean room, with an air lock between any two adjacent rooms, and a curtained doorway between the equipment room and the work area, and a curtained doorway between the clean room and the non-work area. The decontamination system serves as the only entrance/exit for the work area.
- AI. Powered Air Purifying Respirator (PAPR): Either a full face-piece, helmet, or hooded respirator that powers breathing air to the wearer after the air has been purified through a HEPA filter.
- AJ. Regulated Abatement Work Area: The portion of the restricted area where abatement work actually occurs. For tent work areas, the interior of each tent is a regulated abatement work area. For OSHA Class I and Class II asbestos abatement, the interior of the restricted area containment enclosure is the regulated abatement work area. For exterior non-friable asbestos abatement conducted without the establishment of negative air ventilation systems or containment enclosures, the entire restricted area surrounding the abatement location is considered to be the regulated abatement work area.
- AK. Removal: The act of removing and transporting asbestos-containing or asbestos-contaminated materials from the work area to a suitable disposal site.
- AL. Small Asbestos Project: Small asbestos project shall mean an asbestos project involving the removal, disturbance, repair, encapsulation enclosure or handling of more than 10 and less than 160 square feet of ACM, PACM or asbestos material or more than 25 and less than 260 linear feet of ACM, PACM or asbestos material.
- AM. Surfactant: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.
- AN. Tent Procedure: A fire retardant polyethylene enclosure that includes walls, ceiling and a floor as required to remove ACM, PACM or asbestos material.
- AO. Type C Respirator: A respirator which supplies air to the wearer from a source

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

outside the work area by means of a compressor.

- AP. Wet Cleaning: The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with amended water or asbestos removal encapsulant and by afterwards disposing of these cleaning tools as asbestos-contaminated waste.
- AQ. Work Area: Designated rooms, spaces, or areas of the project where asbestos abatement actions are to be undertaken or which may become contaminated as a result of such abatement actions. A contained work area has been sealed, plasticized, and equipped with an airlock entrance or a decontamination enclosure system. A non-contained work area is an isolated or controlled-access area which has not been plasticized.

1.12 REQUIREMENTS AND QUALIFICATIONS:

- A. Minimum Experience: The Contractor shall have experience with abatement work, as evidenced through participation in at least **two** asbestos abatement projects of complexity comparable to this project.
- B. Experience and Training: The Contractor's job supervisors, foremen, and workers shall be adequately trained and knowledgeable in the field of asbestos abatement. All personnel engaged in asbestos abatement or related activities shall have New York State DOL certifications. All phases of the work shall be executed by skilled craftsmen experienced in each respective trade. Proof of such experience shall be submitted upon request by the White Plains CSD. Improperly trained, untrained, or inexperienced personnel shall not be allowed in the work area(s). Personnel shall meet minimum training and experience requirements outlined in this Section.
 - 1. The Contractor's on-site job supervisor shall have successfully completed, within the last twelve months, the NYSDOH-approved course "Supervision of Asbestos Abatement Projects", and shall be qualified as a NYSDOL-certified Contractor/Supervisor. Course must be provided by an NYSDOH-approved training provider. The supervisor shall have experience with abatement work, as evidenced through participation in at least two asbestos abatement projects of complexity comparable to this project.
 - 2. The job supervisors and foremen shall be thoroughly familiar with and experienced in asbestos removal and related work and shall meet the requirements of a competent person set down in OSHA Standard 29 CFR 1926.1101.
 - 3. All asbestos abatement workers shall be knowledgeable, qualified, and trained in the removal, handling, and disposal of asbestos material and in subsequent cleaning of the affected environment. All asbestos abatement workers shall be certified as having attended and satisfactorily

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

completed asbestos worker training in accordance with OSHA Standard 29 CFR 1926.1101(k)(3). Course must be provided by an New York State Department of Health (NYSDOH)-approved training provider.

4. The Contractor's job supervisors, foremen, and asbestos abatement workers shall be certified and licensed as required by the NYSDOL.
 5. Prior to commencement of work, all personnel who are to enter the work area shall be instructed in and shall be knowledgeable of the appropriate procedures for personnel protection and asbestos abatement. On-site training in the use of equipment and facilities unique to this job site shall be performed. Emergency evacuation procedures from the work area shall also be included in worker training.
- C. Supervision Requirements: The Contractor shall provide adequate job supervision for all phases of the asbestos abatement work.
1. The Contractor shall have a NYSDOL job supervisor present on site whenever work described in this Section is in progress. If the job supervisor leaves the site for any reason a qualified and certified supervisor, who meets the requirements of this Section and is familiar with the current status of the work, shall be designated in writing. White Plains CSD's Designated Representative shall be informed of the substitution. The supervisor must be familiar and experienced with asbestos removal and its related work, safety procedures, and equipment.
- D. Worker Medical Examinations: The Contractor shall provide medical examinations for all employees engaged in asbestos removal and disposal operations, in accordance with OSHA Standards 29 CFR 1910.134(b), 1926.1101, and applicable state regulations. The Contractor shall ensure that all employee examination results are on file in his office and available for review and are maintained in accordance with OSHA Standard 29 CFR 1926.1101 (n) (3).
- E. Certificate of Worker's Release: Each asbestos abatement worker, workers of other trades, or any supervisory personnel who enter the work area, or otherwise contact ACM, shall submit a Certificate of Worker's Release, as required in the Section "Submittal".

1.13 TESTING AND INSPECTION REQUIREMENTS AND RESPONSIBILITIES: Visual inspections and air monitoring will be performed before, during, and after asbestos abatement to document airborne asbestos fiber concentrations as defined in this specification.

- A. White Plains CSD's Responsibilities:
1. White Plains CSD will employ an Environmental Consultant to perform Project Monitoring and air testing. The project monitor will have the authority to approve the contractor's work, stop the contractor's work and

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

direct the contractor to take corrective actions where required.

2. Area air samples will be collected and analyzed using National Institute for Occupational Safety and Health (NIOSH) Method 7400. Air samples will be collected during each shift as required by the regulations.
3. Clearance testing by Transmission Electron Microscopy (TEM) will be conducted as per AHERA regulations. Air samples will be collected to demonstrate final re-occupancy clearance for work areas within the building. The fiber concentration must comply with the specified clearance level as per AHERA and this specification. White Plains CSD will provide for collection and analysis of one round of samples required to demonstrate clearance in each discrete work area.
4. White Plains CSD's Environmental Consultant will perform inspections of the work area, as specified, upon request of the Contractor.

B. Contractor's Responsibilities:

1. TEM air samples which fail to meet the re-occupancy clearance standard shall be paid for by the Contractor. Should a delay occur, due to failure(s) of clearance air testing, all associated expenses such as TEM analysis, and the Environmental Consultant's time for additional cleaning and air testing, shall be paid by the Asbestos Contractor. If results of the inside work area group of air samples are unsatisfactory, recleaning of regulated abatement work area surfaces using wet methods, followed by another drying time period and then collection and analysis of an additional set (both inside and outside work area samples) of clearance air samples is required. If only the results of the outside work area group of air samples is unsatisfactory, clean-up of surfaces outside of the regulated abatement work area using HEPA-vacuums and wet-cleaning methods shall be performed prior to collection and analysis of an additional group of outside work area clearance air samples as required by Industrial Code Rule (ICR) 56 Section 56-9.2. This recleaning/clean-up and sampling process shall be repeated until satisfactory clearance air sampling results have been achieved for all asbestos project non-exempt regulated abatement work areas throughout the entire work site.
2. The Contractor, at his/her expense, shall provide OSHA monitoring and all other all tests required by specified applicable regulations, codes, and standards and any other tests for his/her use. The use of a testing laboratory by White Plains CSD does not release the Contractor from providing tests required for the protection and safety of his/her employees.
3. The Contractor shall employ an independent testing laboratory for analysis of OSHA personal air monitoring samples. The laboratory used for air sample analysis shall be successfully participating in the "Proficiency Analytical Testing (PAT) Program for Laboratory Quality Control for Asbestos." The monitoring shall be supervised by an Industrial Hygienist

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

certified by the American Board of Industrial Hygiene (A.B.I.H.). Each testing laboratory shall be ELAP (Environmental Laboratory Accreditation Program) and NVLAP (National Voluntary Laboratory Accreditation Program) certified. White Plains CSD shall approve the contractor's testing laboratory.

4. From each work area the Contractor, at his/her expense, shall collect and analyze OSHA personal air monitoring samples. Sampling shall be repeated during each different work activity. Sample collection and analysis shall be performed using the OSHA Reference Method as outlined in 29 CFR 1926.1101, Appendix A.
 5. Results of all air monitoring performed by the Contractor shall be posted within 24 hours for regular abatement project after collection for all workers to see. A copy of the results shall be given to the White Plains CSD's Environmental Consultant at the same time.
 6. The Contractor shall be advised whenever questions arise concerning compliance with standards of quality and completeness of the work and shall use his/her best efforts to resolve any such questions to the satisfaction of the White Plains CSD's Environmental Consultant.
 7. Where air monitoring tests and/or inspections are specified, the Contractor shall notify White Plains CSD's Environmental Consultant, in writing, 24 hours, in advance of the required test and/or inspection.
 8. The Contractor is responsible for ensuring the Work is complete to the level that meets the criteria of the inspection. The Contractor shall perform an inspection of the Work to evaluate completeness prior to requesting an inspection by the White Plains CSD's Environmental Consultant.
- C. Time Requirements for White Plains CSD's Environmental Consultant's Inspections and Testing: Where visual inspections or air testing is required to be performed by the White Plains CSD's Environmental Consultant, the Contractor shall allow for the following response/analytical time for completion of the inspection/test.
1. Where visual inspections are required, allow 24 hours, beginning from the time the Contractor's request is received by the White Plains CSD's Environmental Consultant, for the performance of the inspection.
 2. Where TEM clearance air monitoring tests are required, allow 24 hours, beginning from the time the Contractor's written request is received by the White Plains CSD's Environmental Consultant, to the beginning of the air test.

PART 2 - PRODUCTS

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

2.1 MATERIALS: Materials provided under this section shall be standard products of manufacturers regularly engaged in the production of the items and shall conform to OSHA Standard 29 CFR 1926.1101; EPA Standard 40 CFR 61, Subpart M; Department of Transportation Standards 49 CFR 171, 172, and 173; applicable state regulations; and requirements specified herein. Materials listed under this section "or equal" shall be provided for work under contract.

- A. Plastic: Provide fire retardant plastic of 6-mil thickness shall be provided in rolls of sizes which will minimize the frequency of joints. Fire retardant plastic sheet shall be used for plasticizing the enclosed work area, for preparation of the decontamination enclosure system, and for waste packaging.
- B. Reinforced Fire-Retardant Plastic: Provide reinforced polyethylene sheet for the floor area of the decontamination enclosure system. Reinforced plastic sheet provided for this project shall be a 19-mil, 3-ply, high density flame resistant-reinforced-polyethylene sheet. Plastic color shall be opaque.
- C. Duct Tape: Duct tape shall be capable of sealing joints of adjacent sheets of plastic and of attaching plastic sheeting to finished surfaces without damage to existing finish and shall be capable of adhering under both dry and wet conditions, including use of amended water
- D. Surfactant: Surfactant (Wetting Agent) shall consist of resin materials in a water base, which have been tested to ensure materials are non-toxic and non-hazardous. Surfactants shall be installed according to the manufacturer's written instructions.
- E. Lockdown Encapsulants: Encapsulants used after asbestos removal to lockdown fugitive fibers shall carry a Class "A" fire resistance rating and shall have an American Society for Testing and Materials (ASTM) E-162 flame spread index of 15 or less. A tint shall be given to the encapsulant by means of the addition of non-toxic, nonflammable colorings before application. The encapsulant shall be installed according to the manufacturer's written instructions.
- F. Caulking Sealant: Caulking sealant shall be single component, non-sag elastomer with 1600% elongation capacity. Sealant shall meet the requirements of Federal Specification TT-S-00230C, Class A Type II. Sealant shall be used to form an airtight seal around plywood barriers or temporary partitions, to seal along the seams of the decontamination enclosure system's plywood sheathing, and to seal around piping or other small penetrations of the work area. Sealant application shall be according to the manufactures written instructions.
- G. Foam Sealant: Foam Sealant shall be expanding urethane Class 1 foam sealant with an Underwriters Laboratories, Inc. (U.L. 723) flame spread index of 25 or less, smoke developed index of 0, and a minimum operating temperature range between -30^oF and 250^oF.
- H. Plywood: Plywood used for temporary partitions, decontamination enclosure

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

systems, and tunnels shall be an exterior grade and a minimum 3/8-inch thick.

- I. Spray Adhesive: Spray Aerosol Adhesive shall be specially formulated to stick to sheet polyethylene (3M 76, 3M 77, or equivalent).
- J. Other Materials: All other materials, such as lumber, plywood, tools, scrapers, brushes, cleaning materials, adhesive, nails, hardware, etc., which are required to perform the work described in this Section shall be provided. Materials and equipment shall be new or used, uncontaminated by asbestos, in serviceable condition, and appropriate for the intended purpose.
- K. Disposal Bags: Plastic Disposal Bags shall be a minimum of 6-mil in thickness. Bags shall be labeled in accordance with this Section.
- L. Shipping Containers: Impermeable Containers shall be suitable to receive and retain any asbestos-containing or asbestos-contaminated materials until they are disposed of at an approved landfill. The containers shall be labeled in accordance with this Section. Containers shall be both airtight and watertight and conform to Department of Transportation (DOT) Standard 49 CFR 178.224. Each container shall be constructed of fiber, hard plastic, or metal, with locking, airtight lids.
- M. Markings and Labels: Disposal bags and shipping containers shall bear danger labels, transportation packaging labels, and generator identification information. Labels shall be permanently affixed to all bags and shipping containers containing ACM, in accordance with OSHA Standard 29 CFR 1926.1101(k)(2), DOT Standard 49 CFR Part 171 and 172, and EPA Standard 40 CFR Part 61.150(a)(1)(v).
 - 1. Danger label format and color shall conform to OSHA Standard 29 CFR 1926.200. Danger labels shall display the following legend/information:

DANGER CONTAINS
ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG
DISEASE HAZARD
 - 2. Department of Transportation (DOT) Marking and Labels: Markings and labels shall be permanently affixed to all bags and containers containing ACM, in accordance with DOT 49 CFR 172.304 and 172.407.
 - a. Markings shall display the following text:

RQ, ASBESTOS, NA 2212
 - b. Labels shall be diamond shape and shall be located near the marking text. Labels will consist of a diamond a minimum of 100 millimeters (mm) on each side with each side having a solid line

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

inner boarder 5.0 to 6.3 mm from the edge. The label shall be white with seven black vertical stripes on the top half. Black stripes and white spaces shall be equally spaced. The lower half of the label shall be white with the class number "9" underlined and centered at the bottom. Refer to DOT 40 172.446 for label format.

3. Generator identification information shall be affixed to each DOT label format and color shall conform to DOT Standard 49 CFR 172.304. Generator identification information labels shall display the following legend/information:

GENERATOR'S NAME GENERATOR'S
24-HOUR PHONE GENERATOR'S
FACILITY ADDRESS

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- N. Reuse of Containers: If impermeable containers used to transport bagged asbestos waste to the landfill are to be reused, the empty containers shall display the following label:

RESIDUE:
LAST CONTAINED ASBESTOS RQ

- O. Warning Signs: Warning Signs shall be posted at the perimeter of the work area prior to abatement operations in accordance with OSHA Standard 29 CFR 1926.1101. Danger sign format and color shall conform to OSHA Standard 29 CFR 1926.200. The signs shall display the legend indicated below:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE
CLOTHING ARE REQUIRED IN THIS AREA

- P. Mastic remover. The contractor shall use an odorless mastic remover. Manufacture and brand of mastic remover shall be approved by the Facility prior to commencing removal work.

2.2 EQUIPMENT: Equipment provided under this section shall conform to applicable federal and state regulations, local codes, and the requirements specified herein.

- A. Spraying Equipment: Equipment used to apply amended water or removal encapsulant shall be of a low-pressure type to prevent disturbance of the asbestos prior to physical controlled removal. Airless spray equipment shall be provided for the application of asbestos encapsulant.
- B. Vehicles: Trucks or Vans used for the transportation of asbestos waste shall be enclosed and suitable for loading, temporary storage, transit, and unloading of asbestos-contaminated waste without exposure to persons or property.
- C. Fall Protection Equipment: Certified and approved equipment to be used by trained personnel when working at elevation to protect against falling from an elevated work area.
- D. Fire Extinguisher: Type "ABC" dry chemical extinguisher or a combination of several extinguisher of National Fire Protection Association (NFPA) recommended types for the fire hazard exposures in each extinguisher location shall be provided. Minimum size of extinguisher shall be 4-A, and 40-B:C. Supply a minimum of one extinguisher for every 1,000 square feet of floor area, with a maximum travel distance to an extinguisher of 75-feet. Supply at least one extinguisher in each decontamination enclosure equipment room, and clean room. Supply 2 additional extinguishers inside the work area

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- E. Smoke Detectors: Smoke detectors of the battery powered ionization type will be required at a rate of one per 5,000 square feet, with a minimum of one smoke detector in the decontamination enclosure clean room, and one in the work area.
- F. Water Filtration System: A system capable of filtering and retaining particles larger than 5.0 microns in size shall be provided.
- G. Carts: Provide watertight wheeled carts with tight fitting lids suitable for movement of non-contaminated waste or bagged asbestos waste from the decontamination enclosure system to the waste storage container or transport vehicle.
- H. Power Tools: Provide power tools necessary to complete the Work. Power tools used directly for asbestos removal shall be equipped with a dust collection system. Attach a shroud connected to a HEPA vacuum system for capture of dust.

2.3 WORKER PROTECTIVE CLOTHING AND EQUIPMENT: Protective clothing and equipment shall conform to OSHA Standard 29 CFR 1926.1101

- A. Protective Clothing: Workers shall be provided with sufficient sets of properly fitting, full-body, disposable coveralls, head covers, gloves, and 18-inch high boot-type foot covers. Disposable coveralls, head covers, and 18-inch high boot-type foot covers shall be constructed of material equal to DuPont "TYVEK-Type 14" or Kimberly-Clark "Kleenguard", as a minimum requirement.
 - 1. The Contractor shall provide authorized visitors and the White Plains CSD's Environmental Consultant suitable properly fitting protective disposable clothing, headgear, hard hats, eye protection, respiratory protection, and footwear (up to four sets per 8-hour shift) whenever they are required to enter the work area.
- B. Equipment: Eye protection and hard hats required for job conditions or by applicable safety regulations shall be provided.
- C. Respiratory Protection: The Contractor shall be solely responsible for providing adequate respiratory protection at all times for all individuals in the work area. Types of respirators used shall be approved by Mine Safety and Health Administration (OSHA)/NIOSH for asbestos in accordance with OSHA Standard 29 CFR 1926.1101 and/or 29 CFR 1910.134. The Contractor shall provide a level of respiratory protection which supplies an airborne fiber level inside the respirator below 0.01 fibers per cubic centimeter (f/cc), as the minimum level of protection allowed. Determine the proper level of protection by dividing the actual airborne fiber count in the work area by the "protection factors" given below for each respirator type:

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

<u>Respirator Type</u>	<u>Protection Factor</u>
Air purifying: Negative-pressure respirator, High efficiency HEPA filter, Half-facepiece	10
Air purifying: Negative-pressure respirator, High efficiency HEPA filter, Full-Facepiece	50 (quantitative)
Powered air purifying (PAPR): Positive pressure respirator High efficiency HEPA filter, Full-facepiece	1000
Type C supplied air: Positive-pressure respirator, Pressure-demand, Full-facepiece HEPA escape	1000
Type C supplied air: Positive-pressure respirator, Pressure-demand, Full-facepiece HEPA escape	1000
Type C supplied air: Pressure-demand, Full-facepiece equipped with an auxiliary SCBA	1000

1. The Contractor shall provide workers with individually issued and marked respiratory equipment. Respiratory equipment shall be suitable for the asbestos exposure level(s) in the work area(s), as specified in OSHA Standard 29 CFR 1926.1101, and as more stringently specified otherwise, herein.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

2. During the use of supplied air systems, the Contractor shall provide authorized visitors, White Plains CSD's Environmental Consultant, and the testing laboratory representative with individually issued and marked respiratory equipment (up to six units). Respiratory equipment shall be compatible with the supplied air system in use, and shall be suitable for the asbestos exposure level(s) in the work area(s), as specified in OSHA Standard 29 CFR 1926.1101, and as more stringently specified otherwise, herein.
3. Where respirators with disposable filter parts are employed, the Contractor will provide sufficient filter parts for replacement as necessary or as required by the applicable regulation.
4. Breathing air supply systems shall conform to the United States Environmental Protection Agency (USEPA) NIOSH Document EPA-560-OPTS-86-001 (September 1986) entitled "A Guide to Respiratory Protection for the Asbestos Abatement Industry."
5. The Contractor shall have a minimum of two spare air hoses with connectors to permit the White Plains CSD's Environmental Consultant or testing laboratory's representative to connect his/her assigned Type C respirator to the air system at any time without having to wait for personnel to exit the work area in order to obtain a spare hose.

PART 3 - EXECUTION

3.1 DECONTAMINATION ENCLOSURE SYSTEMS:

- A. Personal decontamination system enclosures shall be constructed and functional prior to commencing the regulated abatement work area preparation activities. Waste decontamination system enclosures shall be constructed and functional at the completion of preparation activities. After installation of the personal decontamination system enclosure, all access to the regulated abatement work area shall be via the installed personal decontamination system enclosure.
- B. Personal Decontamination System Enclosure - Large Project.
 - (1) Enclosure – General. A personal decontamination system enclosure shall be provided outside the regulated abatement work area and in close proximity to all locations where personnel shall enter or exit the regulated abatement work area. One personal decontamination enclosure system for each regulated abatement work area shall be required. This system may utilize adequate existing lighting sources separate from the decontamination system enclosure or shall be supplied with a GFCI protected temporary lighting system. The personal decontamination system enclosure shall be sized to accommodate the number of workers and equipment required for the intended purpose. Such system may consist of existing attached rooms outside of the regulated abatement work

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

area, if the layout is appropriate, that can be plasticized and are accessible from the regulated abatement work area. When this situation does not exist, personal decontamination enclosure systems may be constructed of metal, wood or plastic supports covered with fire-retardant plastic sheeting. A minimum of one (1) layer of six (6)-mil fire-retardant plastic sheeting shall be installed on the ceiling, and walls of the enclosure system. At least two (2) layers of six (6)-mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of this area. This system must be kept clean, sanitary and climate controlled at all times in conformance with all federal, state and local government requirements. This system shall remain on-site, operational and be used until completion of Phase II C of the asbestos project.

- (2) Rooms and Configuration. The personal decontamination system enclosure shall consist of a clean room, a shower room and an equipment room connected in series but separated from each other by airlocks. There shall be a curtained doorway separation between the equipment room and the regulated abatement work area, and there shall be a lockable door to the outside. (See Figure 1 within ICR 56) Minimum dimensions for each airlock, shower room and equipment room shall be three (3) feet wide by six (6) feet in height, to allow for adequate access to and from the regulated abatement work area.
- (3) Curtained Doorway. An assembly which consists of at least three (3) overlapping sheets of six (6)-mil fire retardant plastic over an existing or temporarily framed doorway. One sheet shall be secured at the top and left side, the second sheet at the top and right side, and the third sheet at the top and left side. All sheets shall have weights attached to the bottom to insure that the sheets hang straight and maintain a seal over the doorway when not in use.
- (4) Framing. Enclosures systems accessible to the public shall be fully framed, hard-wall sheathed and utilize a lockable door for safety and security.
- (5) Sheathing. A plywood or oriented strand board (OSB) sheathing material of at least 3/8-inch thickness.
- (6) Plastic Sheeting. Enclosure systems constructed at the work site shall use at least one (1) layer of six (6)-mil fire-retardant plastic sheeting on walls and ceiling. At least two (2) layers of six (6)-mil fire-retardant reinforced plastic sheeting shall be used for floor protection of this area.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- (7) Prefabricated or Trailer Units. A completely watertight fiberglass or marine painted prefabricated unit does not require plasticizing. Rooms shall be configured as per paragraph (2) of this Section. All prefabricated or trailer decontamination units shall be kept in good condition and shall be completely decontaminated after final cleaning and immediately prior to clearance air sampling. Upon receiving satisfactory clearance air results, the prefabricated units shall be sealed then separated from the regulated abatement work area and removed from the site.
- (8) Clean Room. The clean room shall be sized to accommodate a full work shift of asbestos abatement contractor personnel, as well as the air sampling technician and the project monitor. The clean room shall be a minimum of six (6) feet in height. A minimum of thirty-two (32) square feet of floor space shall be provided for every six (6) full shift abatement workers, calculated on the basis of the largest work shift. If the largest work shift consists of three (3) or less full shift abatement workers, the minimum clean room size requirement is reduced to twenty-four (24) square feet of floor space. Benches, lockers and hooks shall be provided for street clothes. Shelves for storing respirators shall be provided. Clean clothing, replacement filters for respirators, towels and other necessary items shall be provided. The clean room shall not be used for storage of tools, equipment or materials. It shall not be used for office space. A lockable door shall be provided to permit access to the clean room from outside the regulated abatement work area or enclosure and shall be used to secure the regulated abatement work area and decontamination enclosure during non-work hours.
- (9) Shower Room. The shower room shall contain one (1) shower per every six (6) full shift abatement workers, calculated on the basis of the largest work shift. Multiple showers shall be simultaneously accessible (installed in parallel) to certified personnel. Each showerhead shall be supplied with hot and cold water adjustable at the tap. The shower enclosure shall be constructed to ensure against leakage of any kind. Uncontaminated soap, shampoo and towels shall be available at all times. Shower water shall be drained, collected and filtered through a system with at least 5.0-micron particle size collection capability. Submersible pumps shall be installed, maintained and utilized in accordance with pertinent OSHA regulations and manufacturer's recommendations. A multi-stage filtering system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filtering system by larger particles. Filtered wastewater shall be discharged in accordance with applicable codes. Contaminated filters shall be disposed of as asbestos-contaminated waste.
- (10) Equipment Room. The equipment room shall be used for the storage of decontaminated equipment and tools. A one (1)-day supply of replacement filters for HEPA-vacuums and negative pressure ventilation equipment in sealed containers, extra tools, containers of surfactant and other materials and equipment that may be required during the abatement project may also

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

be stored here. A container lined with a labeled, at least six (6)-mil plastic bag for collection of clothing shall be located in this room. Contaminated footwear and work clothes shall be stored in this area.

- (11) Airlocks. Airlock construction shall consist of two (2) curtained doorways with three (3) alternating six (6)-mil fire retardant polyethylene curtains per doorway, separated by a distance of at least three (3) feet, such that one passes through one doorway into the airlock, allowing the doorway sheeting to overlap and close off the opening before proceeding through the next doorway. Minimum airlock size shall be three (3) feet wide, by three (3) feet long, by six (6) feet in height.

C. Personal Decontamination System Enclosure - Small Project

- (1) Enclosure Requirements. A personal decontamination system enclosure for a Small asbestos project shall consist of, at a minimum, an equipment room, a shower room and a clean room separated from each other and from the regulated abatement work area and other areas by curtained doorways as defined in ICR 56 Section 56-2.1. All other provisions for personal decontamination system for a Large asbestos project shall apply. Equipment storage, personal gross decontamination and removal of clothing shall occur in the equipment room just prior to entering the shower. (See Figure 4 in the ICR 56) The full personal decontamination system enclosure specified for Large asbestos projects is recommended.

D. Remote Personal Decontamination System Enclosure. If a personal decontamination system cannot be attached to the regulated abatement work area, due to available space restrictions or other building and fire code restrictions, a remote personal decontamination system enclosure may be used for limited Special Projects as per subpart 56-11, negative pressure tent enclosure work areas with glove-bag only abatement, or if non-friable ACM is being removed in a manner which will not render the ACM friable.

Limitation. If it is found during removal, that the non-friable ACM or asbestos material will become friable during the removal process, and it is logistically possible to attach the decontamination system enclosure, abatement work must stop immediately while the remote personal decontamination system is relocated to be attached and contiguous to the regulated abatement work area.

The following requirements apply for all remote personal decontamination systems:

- (1) Protective Clothing. Workers shall don two (2) sets of disposable protective clothing and a supply of protective clothing shall be kept in the airlocks attached to the regulated abatement work area.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- (2) Location. The remote personal decontamination system shall be constructed as close to the regulated abatement work area as physically possible. If the remote personal decontamination system must be located at the exterior of the building/structure due to space or code restrictions, it shall be constructed within fifty (50) feet of the building/structure exit used for access by the asbestos abatement contractor personnel. The decontamination unit shall be cordoned off at a distance of twenty-five (25) feet to separate it from public areas.
- (3) Airlocks. At a minimum, two (2) extra airlocks as defined in ICR 56 Section 56-2.1 shall be constructed as per ICR 56 Section 56-7.5(b)(11). One shall be constructed at the entrance to the equipment room or equipment/washroom. The other extra airlock shall be constructed at the entrance to the containment or regulated abatement work area(s). These airlocks shall have lockable doorways at the entrance to the airlock from uncontaminated areas. These airlocks shall be cordoned off at a distance of twenty-five (25) feet and appropriately signed in accordance with ICR 56 Section 56-7.4(c). Airlocks shall not be used as a waste decontamination area and shall be kept clean and free of asbestos-containing material.
- (4) Designated Pathway. The walkway from the regulated abatement work area to the personal decontamination system or next regulated abatement work area shall be cordoned off and signage installed as per ICR 56 Section 56-7.4(c), to delineate it from public areas while in use during Phase IIA through IID.
- (5) Travel Through Uncontaminated Areas. If at any time a worker must travel through an uncontaminated area to access the personal decontamination area, the worker shall HEPA-vacuum and/or wet wipe his/her outer protective clothing while in the regulated abatement work area, then proceed into the airlock, which serves as a changing area, where he/she shall remove the outer clothing and don a clean set of protective clothing. The worker may then proceed to the personal decontamination system enclosure only along a designated pathway as described above. Travel in any other area shall not be allowed.
- (6) Removal. The remote personal decontamination unit shall be removed only after satisfactory clearance air sampling results have been achieved.

E. Waste Decontamination System Enclosure - Large and Small Asbestos Projects.

- (1) Enclosure – General. A waste decontamination system enclosure shall be provided outside the regulated abatement work area and shall be attached to the regulated abatement work area. One (1) waste decontamination enclosure for each regulated abatement work area shall be required. This system may utilize adequate existing lighting

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

sources separate from the decontamination system enclosure, or shall be supplied with a GFCI protected temporary lighting system. The waste decontamination system enclosure shall be sized to accommodate the number of workers and equipment for the intended purpose. Such system may consist of existing attached rooms outside of the regulated abatement work area, if the layout is appropriate, that can be plasticized and are accessible from the regulated abatement work area. When this situation does not exist, enclosure systems may be constructed of metal, wood or plastic supports covered with fire-retardant plastic sheeting. A minimum of one (1) layer of six (6) mil fire-retardant plastic sheeting shall be installed on the ceiling, and walls of the enclosure system. At least two (2) layers of six (6)-mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of this area. This system must be kept clean, sanitary and climate controlled at all times in conformance to all federal, state and local government requirements. This system shall remain and be used until completion of Phase II C of the asbestos project.

- (2) Rooms and Configuration. A waste decontamination system enclosure shall consist of a washroom and a holding area connected in series but separated from each other by an airlock. There shall be a lockable door to the outside, and there shall be a curtained doorway between the washroom and the regulated abatement work area. (See Figure 2 in the ICR 56)
- (3) Curtained Doorway. An assembly which consists of at least three (3) overlapping sheets of six (6)-mil fire retardant plastic over an existing or temporarily framed doorway. One (1) sheet shall be secured at the top and left side, the second sheet at the top and right side, and the third sheet at the top and left side. All sheets shall have weights attached to the bottom to insure that the sheets hang straight and maintain a seal over the doorway when not in use.
- (4) Washroom. A room/chamber between the regulated abatement work area and the holding area in the waste decontamination system enclosure, where equipment and waste containers are wet cleaned or HEPA-vacuumed. Adequate drainage and bag/container wash water shall be provided within the room/chamber, as well as a sufficient quantity of clean waste bags/containers.
- (5) Equipment/Washroom Alternative. Where there is only one (1) exit from the regulated abatement work area, the holding area of the waste decontamination system enclosure may branch off from the equipment room of the personal decontamination system enclosure. The equipment room will also be used as a waste washroom. (See Figure 3 in the ICR 56)
- (6) Plastic Sheeting. Waste decontamination system enclosures constructed at the work site shall use at least one (1) layer of six (6)-

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

mil fire-retardant plastic sheeting on walls and ceiling. At least two (2) layers of six (6)-mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of these areas.

- (7) Enclosure Security. The waste decontamination system enclosure and regulated abatement work area airlock(s) (when remote decontamination systems are used) shall be constructed with lockable doors to prevent unauthorized entry. Enclosures systems located within twenty-five (25) feet of an area of public access shall be fully framed and hard-wall sheathed for safety.
- (8) Drains. The waste washroom shall be equipped with a wash bin of sufficient size to perform waste container washing operations and shall have a submersible pump installed to collect wastewater and deliver it to the shower wastewater filtration system where it shall be filtered in accordance with paragraph (b)(9) of this Section.
- (9) Shower/Washroom Alternative - Small Asbestos Project. For Small asbestos projects with only one (1) exit from the regulated abatement work area, the shower room may be used as a waste washroom. The clean room shall not be used for waste storage but shall be used for waste transfer to carts, which shall be immediately removed from the enclosure. Waste shall be transferred only during times when the showers are not in use. (See Figure 4 in this Section)

F. Waste Decontamination System Enclosure – When Remote Personal Is Allowed. When a remote personal decontamination system enclosure is allowed and utilized for a regulated abatement work area, the following requirements shall apply:

- (1) Minor Size Regulated Abatement Work Area. No specific waste decontamination system enclosure is required for minor size regulated abatement work areas. The waste generated shall be immediately bagged/containerized within the regulated abatement work area.
- (2) Small & Large Size Regulated Abatement Work Areas.
 - (i) Washroom. An additional chamber shall be constructed within the regulated abatement work area, attached to the existing airlock used to access the work area. The washroom/airlock combination shall be utilized as the contiguous waste decontamination enclosure for waste bagging/containerization and waste transfer activities. The washroom shall be constructed and supplied with equipment/materials consistent with waste decontamination system enclosure washroom requirements for contiguous personal and waste decontamination system enclosures.
 - (ii) Removal. The washroom chamber shall be removed only after satisfactory clearance air sampling results have been achieved.

3.2 PERSONNEL PROTECTION AND DECONTAMINATION PROCEDURES:

- A. General: The Contractor shall take all safety measures and precautions necessary to protect his/her employees and building occupants in accordance with OSHA Standard 29 CFR 1926, EPA Standard 40 CFR, Part 61, Subpart M, and applicable state and city regulations. The Contractor shall be solely responsible for enforcing personnel protection requirements.
1. After the installation of the personal decontamination system, full Personal protective equipment (PPE) in compliance with current OSHA regulations shall be worn in regulated abatement work areas during preparation activities, for all friable OSHA Class I or Class II asbestos projects. Asbestos abatement contractor's respirator selection, filter selection, medical surveillance and respiratory training must be consistent with current OSHA regulations. Appropriate respiratory protection is also required of all authorized visitors.
 2. Workers or authorized visitors shall not eat, smoke, drink, or chew gum or other substances while in the work area(s) or decontamination area(s).
 3. Contaminated worker footwear, eye protection, and hard hats shall be stored in the equipment room when not in use in the work area and, upon completion of asbestos abatement, disposed of as asbestos-contaminated waste or decontaminated for reuse.
 4. Entry to the personal and waste decontamination system enclosures shall be restricted to the Asbestos Contractors involved with the asbestos project, appropriately certified employees of the Asbestos Contractors, authorized visitors, police, fire and other public safety personnel.
 5. Asbestos workers shall not wear any jewelry; e.g. watch, necklace, etc. while in the work area or decontamination area.
- B. Worker Respiratory Protection: With approval from the White Plains CSD's Environmental Consultant, historical airborne fiber level data may serve as the basis for selection of the level of respiratory protection to be used for the time interval prior to the Contractor establishing the eight-hour time weighted average (TWA) for an abatement task. Historical data provided by the Contractor shall be based on OSHA personal air monitoring of the "breathing zone" of his/her employees for other asbestos abatement projects, and the data were obtained during work operations conducted under work place conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the Contractor's current operations. Documentation of aforementioned results shall be presented to the White Plains CSD's Environmental Consultant for review of applicability. (See "Submittal, Pre-Project Information." This will not relieve the Contractor in providing personal air monitoring to determine the TWA for the work under contract. The TWA shall be determined in accordance with 29 CFR 1926.1101.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

After the TWA is established, the Contractor may provide respirators as presented in the Specification. The minimum level of protection for Thermal System Insulation (TSI) and/or Surfacing Materials abatements is full face-piece Powered Air Purifying Respirator (PAPR).

1. Review safety data sheets (SDS) for products to be used during the work. Follow recommendations as given by the product manufacturer for personnel protection required to be worn during product application.
2. Personal Air Monitoring Requirements: The Contractor's CIH shall be responsible for development and implementation of a personal air monitoring program in accordance with OSHA Standard 29 CFR 1926.1101, good industrial hygiene practices, and the requirements herein. Personal air monitoring shall be performed by an independent testing laboratory and supervised by the Contractor's CIH. Documentation of air sampling shall include as a minimum, calculations of minimum sample volume to achieve necessary detection limits; sampling time; sampling location (or subject); evidence of periodic inspection of sampling equipment; documentation of daily pre- and post-calibration of sampling equipment; detailed description of worker protective devices; description of any typical environmental conditions; and a description of work practices/procedures/controls in operation during the sampling period. Documentation of sample analysis shall include, as a minimum, sample identification; total sample duration, sample flow rate; the "Limit of Reliable Quantification"; total air volume; total fibers counted (with work sheets); total fields counted; blank filter analysis; and reticule field area. Airborne fiber concentrations in fibers per cubic centimeter (f/cc) shall be calculated and reported at the 95 percent confidence level.
3. Full-shift personal exposure air sampling of workers shall be performed to establish the 8-hour (TWA) exposure. Such sampling shall be conducted for each employee (or representative group of employees, at least one sample per eight-man crew) expected to evidence the highest exposure in each work area for each type of activity on the first shift that site preparation, removal, or cleanup activities occur. Similarly, 30-minute personal exposure air sampling shall be conducted during activities anticipated to produce the highest airborne concentrations to determine the Excursion Limit. Personal exposure sampling shall be repeated everyday as per protocol requirements where removal and cleanup operations are conducted for the duration of the project, or at any time that conditions indicate to the Contractor or the Contractor's CIH that the most recent personal sampling results are no longer indicative of employee exposure. PCM personal samples shall be collected and analyzed according to the OSHA Reference Method in OSHA Standard 29 CFR 1926.1101, Appendix B.

- C. **Personnel Entrance and Decontamination Procedures for Gross Removal Operations Utilizing NYSDOL ICR 56-11.7 for Non-Friable Flooring and/or Mastic Removal at the Facility:** The following entry/exit procedures shall be used for gross removal:

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- 1 All workers and authorized visitors shall enter the work area through the worker decontamination enclosure system.
- 2 All individuals who enter the work area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the facility, agents, contractor(s), the project, each work area and worker respiratory protection employed. The site supervisor shall be responsible for the maintenance of the log during the abatement activity.
- 3 Each worker or authorized visitor shall, upon entering the job site, remove street clothes in the clean room and put on a clean respirator (with new filters, if appropriate) and clean protective clothing before entering the work area through the shower room and equipment room.
- 4 Each worker or authorized visitor shall, each time he/she leaves the work area: remove gross contamination from clothing before leaving the work area; proceed to the equipment room and remove all clothing except the respirator; still wearing the respirator, proceed to the shower room; clean the outside of the respirator with soap and water while showering; remove filters, wet them, and dispose of them in the container provided for that purpose; wash and rinse the inside of the respirator; and thoroughly shampoo and wash himself/herself.
- 5 Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately. Disposable clothing of the type worn inside the work area is not permitted outside the work area.

3.3 PREPARATION OF WORK AREA: The following Paragraph "General Preparations" outlines procedures applicable to all work areas. Work procedures specific for preparing each asbestos removal area is addressed in its respective Subparagraph. If a site-specific variance is approved, procedures outlined in the variance will supersede this specification.

A. **General Preparations:** The following general preparations shall be used for all work areas being abated:

1. Erect barricades; post notices and warning signs.
2. Provide and install decontamination enclosure systems in accordance with Article 3.01, "Decontamination Enclosure Systems" of this Section.
3. Seal drains and other collection devices with 6-mil plastic and plywood, as necessary, and provide a system to collect all water used by the Contractor. Collected water shall be passed through a water filtration system prior to being discharged into the sanitary sewer.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

4. Ensure that the Contractor's approved Fall Protection Equipment (if applicable) is in place, in operating condition, and in operation during work described in this section.
5. Maintain emergency and fire exits from the work areas or establish alternative exits satisfactory to the local fire officials. Emergency exits and routes shall be established and clearly marked with florescent paint or other effective designations to permit easy location from anywhere within the work area. Emergency exits shall be secured to prevent access from uncontaminated areas and yet permit emergency exiting. Exits shall be checked daily against exterior blockage or impediments to exiting.
6. Temporary lighting within the work area and decontamination system shall be provided as required to achieve minimum illumination levels.
7. Hand power tools used to drill, cut into, or otherwise disturb ACM shall be equipped by manufacture with HEPA filtered local exhaust ventilation.
8. Hot and cold water may not be available in all work areas. In such cases sufficient heating equipment shall be provided to maintain a necessary supply of hot water for showers.

B. Friable Interior Asbestos-Containing Materials (Tent Enclosure):

1. Tent enclosure work areas shall at a minimum have decontamination areas installed and utilized, as per the requirements of Section 56-11.3.
2. Tents with greater than twenty (20) square feet of floor space, that are scheduled for gross removal of friable ACM, PACM, or asbestos material, shall be constructed of two (2) layers of six (6)-mil fire-retardant plastic sheeting and shall include walls, ceiling and a floor (except for portions of walls, floors and ceilings that are the removal surface) with double folded seams. Seams shall be duct taped airtight and then duct taped flush with the adjacent tent wall.
3. Tents with no gross removal of friable ACM, PACM or asbestos material, shall be constructed of one (1) layer six (6)-mil fire-retardant plastic sheeting and shall include walls, ceiling and a floor (except for portions of walls, floors and ceilings that are the removal surface) with double folded seams. Seams shall be duct taped airtight and then duct taped flush with the adjacent tent wall.
4. Tents or tent-like structures or enclosures shall be adequately supported and reinforced to withstand local environmental conditions and the negative pressures developed within them.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

5. An airlock shall be constructed as per Section 56-7.5(b)(11), at the entrance to each tent that utilizes remote decontamination system facilities. Each tent and airlock shall be cordoned off twenty-five (25) feet from its perimeter, or the interior space/room where the tent and airlock is located shall be secured from non-certified personnel or public access, and signage shall be installed as per Section 56-7.4(c).
 6. Manometers consistent with the requirements of Section 56-7.8(a)(4), are required for negative pressure tent enclosure regulated abatement work areas with OSHA Class I 12 NYCRR 56 Subpart 7, Page 69 abatement. Negative air shall be maintained at four (4) air changes per hour for non-friable and glovebag abatement tent enclosure work areas. Eight (8) air changes per hour shall be maintained for friable gross removal tent enclosure work areas. If a HEPA-filtered vacuum is used for a Minor size abatement tent enclosure work area to maintain the required air changes, after final cleaning is completed twenty (20) minutes shall elapse, then ventilation may be stopped, clearance air samples collected if required, and the tent sealed until results are read. If air sample results are unacceptable, ventilation shall be re-established, the area recleaned and new samples taken.
- C. **Full Containment preparation for Gross Removal:** The Contractor shall perform the following general and gross area preparations for each work area to undergo gross removal using full containment unless procedures outlined in an approved site specific variance are being followed.
1. Request that White Plains CSD's Environmental Consultant perform area monitoring and establish a background count prior to the preparatory operations for each removal area.
 2. Erect barricades; post notices and warning signs.
 3. Shut down, isolate, and lock out or tag heating, ventilating, and air conditioning (HVAC) systems which serve or which pass through the work area. Vents within the work area and seams in HVAC components shall be sealed with tape and two layers of plastic sheeting. Filters in HVAC systems shall be removed and treated as asbestos-contaminated waste.
 4. Shut down, disconnect, and lock out or tag all electric power to the work area so that there is no possibility of its reactivation until after clearance testing of the work area.
 5. Provide and install decontamination enclosure systems in accordance with Article 3.01 (B), "Decontamination Enclosure Systems". Prior to installation of decontamination enclosure system, the floor area shall be covered with one layer of 6-mil plastic sheeting and then 1/2-inch rigid flooring prior to normal decon construction. This procedure (to be implemented only when required) is necessary to protect the existing carpet from being contaminated.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

6. Seal floor drains, sumps and other collection devices with two layers of 6-mil plastic and plywood, as necessary, and provide a system to collect all water used by the Contractor. Collected water shall be passed through a water filtration system prior to being discharged into the sanitary sewer.
7. Ensure that the Contractor's communication equipment is in place, in operating condition, and in operation during work described in this Section.
8. Separate by means of airtight barriers (isolation barriers) parts of the building that are not included in the work area(s) from parts of the building that will undergo asbestos abatement.
9. Seal with isolation barriers: open doorways, cased openings, and corridors which will not be used for passage during work. Any opening equal to or more than 32 square feet shall be sealed with solid (plywood or oriented strand board sheathing material of at least 3/8-inch thickness fastened to the regulated abatement work area side of the barrier partition) isolation barriers, except that where any one dimension is one foot or less.
10. Isolation barriers shall extend from the floor to the drop ceiling and form an airtight seal. They shall be built using wood or metal framing at 24-inch on-center faced with plywood sheathing, and shall be braced as necessary. Both sides of the isolation barrier shall be covered with a double layer of 6-mil plastic sheeting, with joints staggered and sealed with tape. Edges of the temporary partition at the floor, walls, and ceiling shall be taped and caulked airtight. Isolation barriers larger than 32 square feet shall be sheathed on the work area side with 3/8-inch plywood or oriented strand board (OSB) sheathing.
11. Completely seal airtight and isolate the work area. All openings, including but not limited to doorways, windows, tunnels, ducts, grilles, cracks, diffusers, openings through which pipe conduit passes, and any other penetrations of the work area, shall be covered with plastic sheeting taped or caulked airtight. Refer to updated ICR 56 for the elevator shaft ports isolation details.
12. Maintain emergency and fire exits from the work areas or establish alternative exits satisfactory to the local fire officials. Emergency exits and routes shall be established and clearly marked with fluorescent paint or other effective designations to permit easy location from anywhere within the work area. Emergency exits shall be secured to prevent access from uncontaminated areas and yet permit emergency exiting. Exits shall be checked daily against exterior blockage or impediments to exiting.
13. Temporary lighting within the work area and decontamination system shall be provided as required to achieve minimum illumination levels.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

14. After sealing and plasticizing the area install and initiate operation of at least two air filtration devices to provide a negative pressure of at least -0.02 inches of water and four (4) changes per hour within the work area relative to surrounding non-work areas. Do not shut down AFD's until the work area is released to the Owner following final clearance procedures. All air filtration device filters shall be new and shall be installed on-site under the supervision of White Plains CSD's Environmental Consultant. The contractor shall utilize Applicable Variance-A-2 (AV-A-2) at the locations with negative unit exhaust greater than 25-foot in length.
15. Hand power tools used to drill, cut into, or otherwise disturb ACM shall be manufacture equipped with HEPA-filtered local exhaust ventilation.
16. Scaffolds shall be provided for workers engaged in work that cannot safely be performed from the ground or other solid work area surface.
17. Work Area Precleaning Procedures: After establishing the decontamination enclosure system, prepare and pre-clean the work area as specified below and as indicated by the drawing notes:
 - a. Movable and loose items not removed by the facility from work areas shall be cleaned using HEPA vacuum equipment and/or wet cleaning methods as appropriate and shall be removed from the work area and stored at the Owner's direction.
 - b. Movable and loose items contaminated with asbestos shall be wrapped or placed in labeled ACM bags. Sealed ACM bags shall be removed from the work areas and properly discarded as asbestos-contaminated waste.
 - c. Fixed objects within the work area shall be pre-cleaned using HEPA vacuum equipment and/or wet cleaning methods as appropriate. Joints of covers or casings shall be sealed with tape and fixed objects enclosed with a minimum of two layers of 6-mil plastic sheeting sealed airtight with tape. Disassembly of these fixed objects is not required unless otherwise noted. Fixed objects shall include, but not be limited to, light fixtures, junction boxes, hangers and black carrying channels.
 - d. Prior to being plasticized, the work areas shall be cleaned using HEPA vacuum equipment and/or wet cleaning methods as appropriate. Methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters, shall not be used.
18. Plasticize the area after pre-cleaning, using the following procedure:
 - a. Cover floor with one layer of 6-mil plastic sheeting, turning layer a minimum of 12 inches up wall, and seal layer to wall.
 - b. Cover walls with one layer of 6-mil plastic sheet, lapping wall layer a minimum of 12 inches, and seal layer to floor layer.

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

- c. Cover ceiling with one layer of 6-mil plastic sheet, lapping wall layer a minimum of 12 inches, and seal layer to wall layer
 - c. Repeat procedure for second layer. All joints in plastic sheets shall be glued and taped in such a manner as to prohibit air passage. All seams within a layer shall be separated by a distance of at least six (6) feet and sealed airtight with duct tape. All seams between layers shall be staggered at least two (2) feet.
19. Areas immediately adjacent to removal areas, such as corridors or hallways which are not in work areas but are necessary routes to and from work areas, shall be protected with two layers of 6-mil plastic sheet on floors and two layers of 6-mil plastic sheet on walls and ceilings.

3.4 PRE-REMOVAL INSPECTIONS:

- A. Prior to removal of any ACM the Contractor shall notify the White Plains CSD's Environmental Consultant and request a pre-removal inspection. Posting of warning signs, plasticizing of work area, building of decontamination enclosure systems, and all other preparatory steps have been taken prior to notification of White Plains CSD's Environmental Consultant. The Contractor shall not begin asbestos removal until the White Plains CSD's Environmental Consultant approves the work area preparations.

3.5 MAINTENANCE OF CONTAINED WORK AREA AND DECONTAMINATION ENCLOSURE SYSTEMS:

- A. Repair damaged barriers and remedy any defects immediately upon their discovery. Visually inspect barriers at the beginning and end of each work period.
- B. Visually inspect non-Work Areas and the decontamination enclosure system for water leakage. Check the floor below, ceiling and walls, and view beneath/or around the decontamination enclosure system, for signs of leakage. Perform the visual inspection a minimum of twice each 8-hour work shift.
- C. Ensure that both hot and cold water exist in sufficient supply for the decontamination enclosure system.

- 3.6 REMOVAL OF ASBESTOS-CONTAINING MATERIAL:** The Asbestos Contractor shall be responsible for the proper removal of ACM from the Work Area using standard abatement industry removal techniques. The Environmental Consultant or their representative shall observe the Work. Approval of the Asbestos Contractor's abatement techniques is required by the Environmental Consultant to allow for the continuance of work.

1. Removal of Interior Friable Asbestos-Containing Materials (Tent Enclosure):

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

1. All persons shall don appropriate personal protective equipment before entering the tent in compliance with current OSHA regulations. Authorized visitors entering the tent shall also don NIOSH-approved respiratory protection.
2. A HEPA-vacuum or other negative pressure HEPA-filtered ventilation equipment shall be used to continuously exhaust 12 NYCRR 56 Subpart 11, Page 100 the tent in accordance with Sections 56-7.8(a) and 56-7.11(f)(1).
3. All material to be removed shall be saturated with amended water as specified in this Part.
4. Asbestos material shall be removed and sealed in plastic bags prior to removal from tent. Edges of asbestos material remaining shall be encapsulated or sealed with wettable cloth.
5. The substrate from which asbestos was removed and any exposed edges shall be sealed with encapsulant.

2. Additional Removal Requirements:

- A. White Plains CSD's Environmental Consultant shall issue a stop work order if visible emissions are detected outside the work areas and/or should the fiber count in adjacent non-work areas exceed 0.01 f/cc of air or the background count (use the greater of these two values as the reference). Work shall not resume until the condition(s) causing the increase are corrected, surfaces outside of the work area are decontaminated using HEPA vacuums or wet cleaning techniques and the Contractor receives written notice from White Plains CSD's Environmental Consultant.

3.7 ACM WASTE PACKAGING AND LOAD OUT PROCEDURES:

- A. Packaging of ACM shall conform to OSHA Standard 29 CFR 1926.1101, DOT 49 CFR 171,172, and 173, EPA Standard 40 CFR Part 61, New York City Department of Sanitation (in relation to transport, storage, and disposal of ACM) and the requirement as heretofore specified. ACM waste shall be placed in a wet condition into properly labeled disposal bags or sealed in two layers of 6-mil plastic sheeting wrapped airtight and properly labeled. Materials to be transported through a non-Work Area building space shall be placed in hard wall shipping containers for handling. Specific requirements for decontamination of waste containers, and load out through the decontamination enclosure systems is outlined below:
- B. Frequency of Waste Removal: Properly packaged and labeled asbestos waste shall be removed from the site on a daily basis. Under no circumstance shall asbestos waste be stored on site. The waste hauler and landfill shall be as indicated on the notifications to regulatory agencies.
- C. Waste Load-out Through Waste Decontamination Unit: Place asbestos waste in disposal bags. Large items not able to fit into disposal bags shall be wrapped in

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

one layer of 6-mil thick plastic sheeting. Clean outer covering of asbestos waste package by wet cleaning and/or HEPA vacuuming in a designated part of the Work Area. Move wrapped asbestos waste to the washroom, wet clean each bag or object and place it inside a second disposal bag, or a second layer of 6-mil plastic sheeting, as the item's physical characteristics demand. Air volume shall be minimized, and the bags or sheeting shall be sealed airtight with tape.

- D. The clean containerized items shall be moved directly to the Waste Hauler's truck pending load-out to storage or disposal facilities.
- E. Workers who have entered the decontamination enclosure system from the uncontaminated non-work area shall perform load-out of containers from the decontamination enclosure holding area. Dress workers that handle asbestos waste to storage or disposal facilities in clean overalls of a color different than from that of coveralls used in the Work Area. Ensure that workers do not enter from uncontaminated areas into the equipment washroom or the Work Area. Ensure that contaminated workers do not exit the Work Area through the equipment decontamination enclosure system.
- F. Thoroughly clean the decontamination enclosure system immediately upon completion of the waste load-out activities, and at the completion of each work shift.
- G. Labeled ACM waste containers or bags shall not be used for non-ACM debris or trash. Any materials placed in labeled containers or bags, whether turned inside out or not, shall be handled and disposed of as ACM waste.

3.8 CLEANUP AND CLEARANCE TESTING OF WORK AREAS: The following clean-up procedures shall be performed during abatement.

- A. Visible accumulations of loose asbestos-containing waste material shall be cleaned up using rubber or plastic dustpans and rubber squeegees or HEPA filtered vacuums. Metal shovels may also be used, except in the vicinity of plastic sheeting, critical barriers and isolation barriers, which could be perforated by these tools. To pick up excess water and gross wet debris, a wet-dry HEPA filtered shop vacuum dedicated to asbestos abatement may be used. This cleaning shall be done whenever there is sufficient asbestos waste material to fill a single leak-tight bag/container, or this cleaning shall be done at the end of each work shift whichever shall occur first. Visible debris shall be maintained adequately wet.
- B. Work shall stop whenever excessive water accumulation or flooding is present in the area and shall not resume until the water is collected and disposed of properly.

3.9 DISPOSAL AND TRANSPORTATION OF ASBESTOS-CONTAMINATED WASTE:

- A. Storage of Containerized ACM: As the work progresses, remove sealed and

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

labeled bags of ACM from the Work Area and place in a lockable trailer, dumpster, or other container approved for storage or transport of asbestos waste. The waste container shall be lined with two layers of 6-mil fire retardant plastic on all sides. Asbestos-containing waste shall remain under the positive control of the Asbestos Contractor and must never be left unattended in an area or on a vehicle where unauthorized persons could gain access. Containerized ACM shall be removed from the site on a daily basis. Unless specifically approved in writing by the Owner, ACM shall not be permitted to be stored on site during non-working hours.

- B. Sealed and labeled bags or waste wrapped in two layers of plastic sheeting sealed airtight shall be used to transport asbestos-contaminated waste to the landfill. Procedures for hauling and disposal shall comply with 40 CFR, Part 61, 49 CFR, Part 171 and 172, and other applicable state, regional, and local government regulations. Procedures for removal from the Work Area and disposal of waste are outlined below:
- C. A properly completed and original "Waste Shipment Record" form shall accompany asbestos waste, which is transported to a disposal site. This form shall be signed and dated by each party who has control over the asbestos waste, and a copy retained by each party as responsibility for the waste is transferred to the next party. All original manifest forms and waste receipts shall be provided to the Architect or White Plains CSD representative. The Environmental Consultant shall be provided with copies of all waste manifests.
- D. Trucks hauling asbestos waste shall be totally enclosed to prevent loss or damage to waste container en-route to approved landfill. The interior of the vehicles shall be lined with two layers of 6-mil plastic.
- E. Mark with a visible warning sign during the loading and unloading of asbestos-containing waste all vehicles used to transport the waste material. Danger sign legend, text size, style and arrangement shall conform to the requirements of EPA Standard 40 CFR Part 61.149 (d) (I).
- F. Only sealed plastic bags or completely sealed items shall be deposited in landfill. Damaged, broken sealed windows or leaking plastic bags shall be resealed prior to being deposited in the landfill. Workers shall place asbestos waste in the landfill. Throwing or dumping of containers shall not be allowed. Workers unloading and handling the sealed bags/drums at the disposal site shall wear appropriate personnel protective equipment including respirators and protective clothing.
- G. After the vehicle is unloaded at the landfill, the plastic sheeting that was taped to the floor, sides and top of the truck shall be carefully removed and placed in properly labeled bags for disposal with the rest of the waste.

END OF SECTION

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

LIST OF SUBMITTALS

<u>SUBMITTAL</u>	<u>DATE SUBMITTED</u>	<u>DATE APPROVED</u>
Pre-Project Submittal:		
1. Insurance	_____	_____
2. All required bonds	_____	_____
3. List of Subcontractors	_____	_____
4. Health and Safety Plan	_____	_____
5. Proof that all required permits and variances have been obtained	_____	_____
6. Documentation of Required Qualifications of Workers	_____	_____
7. Proof of a respiratory protection program.	_____	_____
8. Proof of historic airborne fiber data.	_____	_____
9. Proof that a landfill site has been located.	_____	_____
10. SDS of chemicals to be used on this project.	_____	_____
11. Asbestos Removal and Disposal Work Plan	_____	_____
During Work Submittal:		
1. Schedule of Work Changes	_____	_____
2. Notarized copy of weekly payroll showing a prevailing wage rate has been paid.	_____	_____
3. A "Request For Services" form.	_____	_____

Asbestos Abatement – George Washington Elementary School
Toilet Room Renovations

4. Results of all air monitoring performed by the Contractor (OSHA) _____

5. A certified, signed, and completed copy of each "Waste Shipment Record" form (Section 1.07) _____

6. A copy of the bound log book _____

Post Project Submittal:

1. A notarized "Release of Liens" _____

2. Proof of payment of prevailing wage rate _____

3. Notarized copies of a daily log. _____

4. Compilation in chronological order of all air monitoring records pertaining to this project. _____

5. Compilation of all completed and signed Waste Shipment Record forms. _____

6. Copies of notifications to applicable agencies. _____

7. Paid invoice verifications for sub-contractor (for Time and Material job), service contract agreement, insurance certificates, copies of the workers licenses, and other required submittals. _____

SECTION 02 83 33

INCIDENTAL DISTURBANCE OF LEAD-CONTAINING PAINT

PART 1. GENERAL

1.01 SUMMARY

- A. This section specifies requirements when renovating, repairing or painting in target housing and child occupied facilities built before 1978. Activities impacting lead-based paint (LBP) that are subject to the requirements of this section include but are not limited to: remodeling and repair/maintenance; electrical work; plumbing repairs or improvements; painting; carpentry; window replacement; demolition of painted walls or ceilings; re-plastering; any other activities which will disturb painted surfaces.
- B. This section does not apply to lead abatement projects in housing and child occupied facilities. Lead abatement is work designed to permanently eliminate lead-based paint hazards.
- C. Extent of LBP is as follows and detailed in the following project:
GEORGE WASHINGTON ELEMENTARY SCHOOL – TOILET ROOM RENOVATIONS.
 - 1. As detailed in FINAL REPORT OF ENVIRONMENTAL SERVICES, dated February 19, 2021.
- D. Prohibited Activities
 - 1. Prohibited activities include open flame burning/torching, using a heat gun above 1,100 degrees Fahrenheit (°F) and sanding, grinding, planing, needle gunning or blasting without a shroud and HEPA vacuum attachment, and usage of chemical stripper in an enclosed area without appropriate ventilation.

1.02 REGULATORY REQUIREMENTS

- A. Comply with the requirements of the most recent version of the following laws, codes, regulations, guides and standards:
 - 1. Code of Federal Regulations (CFR)
 - a. 29 CFR 1926, Occupational Safety and Health Regulations for Construction
 - b. 29 CFR 1926.51, Sanitation
 - c. 29 CFR 1926.55, Gases, Vapors, Fumes, Dusts, and Mists
 - d. 29 CFR 1926.62, Lead
 - e. 40 CFR 50, National Primary and Secondary Ambient Air Quality Standards
 - f. 40 CFR 58, Ambient Air Quality Surveillance
 - g. 40 CFR 60, App. A., Method 22, Visual Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Fires

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

- h. 40 CFR 261, Appendix II EPA, Toxicity Characteristic Leaching Procedure
 - i. 40 CFR 262, Standards Applicable to Generators of Hazardous Waste
 - j. 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste
 - k. 40 CFR 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
 - l. 40 CFR 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
 - m. 40 CFR 265, Subpart C, Preparedness and Prevention
 - n. 40 CFR 265, Subpart D, Contingency Plan and Emergency Procedures
 - o. 40 CFR 265.16, Personnel Training
 - p. 40 CFR 268, Land Disposal Restrictions
 - q. 40 CFR 302, Designation, Reportable Quantities and Notification
 - r. 49 CFR 171-179, Transportation of Hazardous Materials Regulations
2. EPA Methods
- a. SW 846, Test Methods for Evaluating Solid Waste - Physical/Chemical Methods
 - b. Method 1311, Toxicity Characteristic Leaching Procedure (TCLP)
 - c. Method 3050, Acid Digestion of Sediment, Sludge, and Soils
 - d. EPA/600/R-94/038b, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, Sections 2.8 (Lead) and 2.11 (PM-10).
 - e. National Lead Laboratory Accreditation Program
3. Codes, Rules and Regulations of the State of New York (NYCRR)
- a. Title 6, Chapter III, Subchapter B, Air Resources
 - b. Title 6, Chapter IV, Subchapter B, Solid and Hazardous Waste Laws
 - c. Title 6, Division of Environmental Remediation
4. NIOSH Method
- a. Method 7082, Lead
5. American National Standards Institute (ANSI) Publications:
- a. Z88.2-80 Practices for Respiratory Protection.
 - b. Z87.1 Eye Protection.
6. American Industrial Hygiene Association

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

- a. Proficiency Analytical Testing Program (PAT) for metals analysis
 - b. Environmental Lead Proficiency Analytical Testing Program (ELPAT)
7. ASTM International
- a. ASTM Standard E 1728 sampling methodologies
8. Federal Department of Motor Vehicles-Code of Federal Regulations Part 571.
- a. Federal Motor Vehicle Safety Standard 571.302, “Flammability of Interior Materials.”
- 1.03 New York State Department of Health INTERIM GUIDANCE FOR CONSTRUCTION ACTIVITIES DURING THE COVID-19 PUBLIC HEALTH EMERGENCY.
- A. This guidance document must be followed by renovator, as applicable, for: Physical Distancing, Employee Indoor Gathering, Workplace Activity and Movement; Protective Equipment, Hygiene/Cleaning/Disinfecting, and Communications Plan; and Screening/Testing, Tracing and Tracking.
- 1.04 DEFINITIONS
- A. The term "Abatement" signifies any measure or set of measures designed to permanently eliminate lead-based paint hazards from the target housing or child-occupied facility as defined in 40 CFR part 745, subpart L. Abatement includes, but is not limited to:
 1. The removal of lead-based paint and lead-contaminated dust, the permanent enclosure or encapsulation of lead-based paint, the replacement of lead-painted surfaces or fixtures, and the removal or covering of lead-contaminated soil.
 2. Preparation, cleanup, disposal, and post-abatement clearance testing activities associated with such measures.
 - B. The term "Action Level" means an airborne concentration of lead of 30 micrograms per cubic meter of air calculated as an 8-hour time- weighted average (TWA).
 - C. The term “Certified Inspector or Risk Assessor” means an individual who has been trained and is certified by the Environmental Protection Agency (EPA) to conduct lead-based paint inspections or risk assessments.
 - D. The term "Child-occupied Facility" means a building, or portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day’s visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Child-occupied facilities may include, but are not limited to, day-care centers, preschools and kindergarten classrooms.
 - E. The term “Cleaning Verification Card” means a card developed and distributed, or otherwise approved, by the EPA for the purpose of determining, through comparison of wet and dry disposable cleaning cloths with the card, whether post-renovation cleaning has been properly completed.

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

- F. The term “Common Area” means a portion of a building that is generally accessible to all residents or users. Common areas include (but are not limited to) hallways, stairways, laundry rooms, recreation rooms, playgrounds, community centers and fenced areas whether interior or exterior spaces.
- G. The term “Component” means a specific design or structural element or fixture distinguished by its form, function, and location. A component can be located inside or outside the dwelling. Examples include (but are not limited to) ceilings, wall, floors, shelves, crown molding, trim, fences, handrails window sills and soffits.
- H. The term "Containment" means a process to protect workers and the environment by controlling exposures to the lead-contaminated dust and debris created during a renovation, repair or painting project.
- I. The term "Critical Barrier" indicates the perimeter of the enclosure within which lead disruption/removal work takes place. Critical Barriers may include existing floor, wall, and ceiling structures, as well as constructed partitions, closures and seals.
- J. The term "Encapsulant" means a substance that forms a barrier between lead-based paint and the environment using a liquid- applied coating (with or without reinforcement materials) or an adhesively bonded covering material.
- K. The term "Enclosure" means the use of rigid, durable construction materials that are mechanically fastened to the substrate in order to act as a barrier between lead-based paint and the environment.
- L. The term "Exposure Assessment" means a determination of employee exposure for a given task measured by air sampling. The Assessment must meet the criteria for objective data as outlined in the OSHA Lead in Construction Standard (29 CFR 1926.62).
- M. The term "Hazardous Waste" refers to a listed waste or any solid or liquid waste with one or more of the following characteristics: toxic, corrosive, flammable, explosive, combustible, oxidizer, pyrophoric, unstable (reactive) or water - reactive. This definition includes lead paint that has been removed from the substrate and has failed the TCLP for any reason.
- N. The term "Inspection" means a surface-by-surface investigation to determine the presence of lead-based paint and the provision of a report explaining the results of the investigation.
- O. The term "Lead-Based Paint" (LBP) is identified as paint or other surface coatings that contain lead equal to or in excess of 1.0 milligrams per square centimeter or more than 0.5 percent by weight or lesser value as defined by EPA.
- P. The term "Non-Hazardous Waste" refers to any solid or liquid waste not exhibiting characteristics of Hazardous Waste. This definition includes lead-based paint not removed from substrate and not failing TCLP for other characteristics. It also includes lead paint chips that do not fail the TCLP for any reason.
- Q. The term "OSHA PEL" stands for the Permissible Exposure Limit established by the Occupational Safety and Health Administration for lead exposure. The OSHA PEL refers to an airborne concentration of lead of 50 micrograms per cubic meter of air calculated as an 8-hour time-weighted average (TWA).
- R. The term “Renovation” refers to a modification of all or part of any existing

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

structure that disturbs a painted surface, including (but not limited to) removal/modification of painted surfaces, components or structures, surface preparation activities and window replacement as defined in 40 CFR part 745, subpart E.

- S. The term "Renovator" means a person who either performs or directs workers who perform a renovation. A certified renovator is a renovator who has successfully completed a renovator course accredited by the EPA. Note: because the term renovation is broadly defined by the EPA rule "Lead-Based Paint Renovation, Repair and Painting Program" (RRP) contractors such as electricians and plumbers may be considered "renovators" under this rule.
- T. The term "Target Housing" refers to housing constructed before 1978, except for: housing for the elderly, dormitories, studio apartments, efficiencies, military barracks and rentals of individual rooms.
- U. The term "TCLP" stands for Toxicity Characteristic Leaching Procedure and refers to one of the tests to determine if waste is to be disposed as a Hazardous Waste or non-hazardous solid waste.
- V. The term "Wet Disposable Cleaning Cloth" refers to a commercially available, pre-moistened, white disposable cloth designed to be used for cleaning hard surfaces such as countertops and uncarpeted floors.

1.05 QUALIFICATIONS AND EXPERIENCE

A. Entity Performing Lead Paint Incidental Disturbance

- 1. For Work that may result in the incidental disturbance of LCP, the contractor does not need any certification other than the RRP certification, for the scope of work specified in this specification section, provided that the entity performing Work does not represent himself as a lead paint abatement contractor.

B. Laboratory Qualifications

- 1. Verify that the analytical laboratories performing testing required under this Section are accredited by The American Industrial Hygiene Association (AIHA) ELLAP accreditation program for environmental lead analysis, and have successfully participated (within previous 12 months) in the AIHA Environmental Proficiency Analytical Testing (ELPAT) program.

C. Competent Person/Supervisor performing lead paint incidental disturbance shall possess:

- 1. Proof of completion of 29 CFR 1926.62 "Lead in Construction" training.
- 2. Proof of training under the Resource Conservation and Recovery Act (RCRA), in accordance with 40 CFR 265.16.

D. Workers performing lead paint incidental disturbance shall have proof of completion of training required by 29 CFR 1926.62.

1.06 QUALITY ASSURANCE

- A. Waste Handling Plan: Prepare a waste handling plan that addresses the proper handling and disposal of all waste, including TCLP waste characterization testing.

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

- B. Contingency Procedures Program: Submit a contingency procedures program to respond to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil or surface water at the construction site. Include the following:
 - 1. List of names, addresses and phone numbers of all persons qualified to act as emergency coordinators. Include a list of all emergency equipment at the construction site (fire extinguishers, spill control equipment, communications, alarm systems and decontamination equipment).

1.07 SUBMITTALS

- A. Project Information:
 - 1. Copy of Firm Certification from the EPA.
 - 2. Schedule of renovation, repair and painting activities.
 - 3. Length and number of shifts.
 - 4. Certified supervisor name, crew size, length and number of shifts.
- B. Health and Safety Requirements: Information must be provided for all workers that will conduct renovation, repair and painting activities on site, including the following for each employee that will conduct lead disturbance on the job site:
 - 1. Exposure Assessment Documentation, if available.
 - 2. Respiratory Protection Program.
 - 3. Proof of current fit test for respirator that will be worn on Project Site.
 - 4. Proof of medical surveillance for respirator usage and lead work.
 - 5. Proof of certified renovator training and accreditation for each supervisor on-site.
 - 6. Proof of lead awareness training and medical approvals for all workers on-site
- C. Qualifications
 - 1. Qualifications, experience and certification information for all personnel who will potentially work on this project and laboratory as specified in 1.05 of this Section.
 - 2. Names, addresses, qualifications and contact persons for the transporter(s) of hazardous waste, non hazardous waste and waste water. Furnish evidence that each transporter has current registration approved by NYSDEC and/or DOT, as applicable.
 - 3. Name, address, telephone number and contact person for each waste disposal facility to be used on this project. Furnish evidence that each disposal facility has current registrations and permits for the operation of such facilities, or written approval from the state (and by the USEPA or other local agency, if applicable) in which it operates.
- D. Renovation Work Notification
 - 1. Renovations in Housing or other Dwelling Units

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

- a. Occupants of units where renovations will take place must be provided with EPA's lead pamphlet "Renovate Right-Important Lead Hazard Information for Families, Child Care Providers and Schools".
 - b. Obtain written acknowledgement from an adult occupant that the pamphlet has been received or certify in writing that the pamphlet has been delivered to the dwelling and the occupant refused to sign or was unavailable.
 - c. Obtain a certificate of mailing at least 7 days prior to the renovation.
 - d. The written certification must include the address of the unit undergoing renovation, the date and method of delivery of the pamphlet, name of person delivering the pamphlet, reason for lack of acknowledgement, the signature of a representative of the firm performing the renovation and the date of the signature.
2. Renovations in Common Areas
- a. Where renovations take place in common areas, occupants of affected units must be notified in writing. Such notification shall be accomplished by distributing the written notification to each affected unit.
 - b. The notice shall describe the general nature and locations of the planned renovations activities, the expected start and ending dates and a statement of how the occupant can obtain the EPA lead pamphlet at no cost.
 - c. Obtain a certificate of mailing at least 7 days prior to the renovation.
 - d. In place of the written notification to each affected unit the renovator may, while the renovation is ongoing, post in an area likely to be seen by occupants of all the units, informational signs describing the general nature and locations of the work and anticipated completion date. Additionally post a copy of the EPA lead pamphlet or information on how to obtain a copy free of charge from the renovator.
 - e. Prepare sign and date a statement describing the steps performed to notify all occupants of the intended renovation activities and to provide the pamphlet.
 - f. If the scope, locations or expected starting and ending dates change, re-notify the occupants prior to beginning additional renovation work.
3. Renovations in Child-Occupied Facilities (including schools)
- a. Child-occupied facilities where renovations will take place must be provided with the EPA's lead pamphlet "Renovate Right-Important Lead Hazard Information for Families, Child Care Providers and Schools".
 - b. Obtain written acknowledgement from an adult representative of the child-occupied facility that the pamphlet has been received or certify in writing that the pamphlet has been delivered to the child-occupied facility and the adult representative refused to sign or was unavailable.
 - c. Obtain a certificate of mailing at least 7 days prior to the renovation.
 - d. The written certification must include the address of the unit undergoing

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

renovation, the date and method of delivery of the pamphlet, name of person delivering the pamphlet, reason for lack of acknowledgement, the signature of a representative of the firm performing the renovation and the date of the signature.

- e. Provide the parents or guardians of children using the child-occupied facility with the pamphlet and the information describing the general nature and locations of the renovation and the anticipated completion date by mailing or hand-delivering the information. Or, while the renovation is ongoing, post in an area likely to be seen by the parents or guardians of the children frequenting the child-occupied facility, informational signs describing the general nature and locations of the work and anticipated completion date. Additionally post a copy of the pamphlet or information on how to obtain a copy free of charge from the renovator.
- f. The renovation firm must prepare, sign and date a statement describing the steps performed to notify all parents and guardians of the intended renovation activities and to provide the pamphlet.
- g. Any written acknowledgements required above must include the occupant's name and acknowledgement that the pamphlet was received prior to the renovation, the address of the facility undergoing renovation and the dated signature of the occupant.

E. Record Documents

- 1. Waste Handling Plan that addresses the proper handling and disposal of all waste as specified in 1.06 of this Section.
- 2. Contingency Procedures program, as specified in 1.06 of this Section.
- 3. Copy of signed manifests for each load of waste material transported from the construction site. Furnish the manifest within one day of shipment.
- 4. Copy of executed waste manifest form signed by a responsible party of the disposal facility. If the copy is not received within 35 days from the date of shipment, contact the Owner's project officer/engineer, and assist as directed, in efforts to locate the manifest, and in the completion of the EPA Exception Reports.

PART 2. PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Furnish all equipment and materials needed to perform Work in accordance with the requirements of this Section. This may include mops, buckets, cleaning supplies, ground covers, rigging, scaffolding, planking, containment materials, dust collection equipment, High Efficiency Particulate Air (HEPA) vacuums, waste containers, monitoring and testing equipment, and personal protective equipment.
- B. The Renovator shall use equipment that is free of loose dust and debris when brought onto each Work Site, and upon removal. The Renovator shall vacuum using HEPA (High Efficiency Particulate Air) filtered vacuum shrouds and/or wet wipe the equipment with an approved cleaning solution to assure that it is clean prior to removal from any Work Site.

PART 3. EXECUTION

3.01 LEAD RENOVATION, GENERAL

- A. Conduct lead renovation, repair and painting activities in accordance with all state and federal regulations and guidelines.
- B. Assign a Certified Renovator (i.e. Supervisor) to the project who will remain on- site during all renovation, repair and painting work.
- C. Maintain at each job site and post the following documents
 - 1. This specification section.
 - 2. EPA Renovator Certificates for each supervisor (initial and the most recent refresher).
 - 3. Proof of lead awareness training and medical approvals for all workers on-site.
 - 4. For renovations in common areas and child care facilities post a written notification detailing the general nature and locations of the work and anticipated completion date.
 - 5. For renovations in common areas and child care facilities post a copy of the EPA lead pamphlet “Renovate Right- Important Lead Hazard Information for Families, Child Care Providers and Schools”.
- D. Open-flame burning or torching of lead-based paint is prohibited.
- E. Machine sanding, grinding, abrasive blasting and sandblasting of lead-based paint is prohibited, unless the sanding, grinding, blasting, or sandblasting is conducted using a shrouded tool with a high-efficiency particulate air (HEPA) exhaust control that removes particles of 0.3 microns or larger from the air at an efficiency of 99.97% or more.
- F. Dry scraping of lead-based paint is permitted only in conjunction with heat guns or around electrical outlets. Operating a heat gun on lead-based paint is permitted only if the temperature generated by the heat gun is less than 1,100 °F.
- G. Ensure the Competent Person/Supervisor performs daily inspections of the Work area to ensure compliance with all requirements of this Section. A Written Compliance Program (WCP) shall be prepared in accordance with 29 CFR 1926.62 (e)(2)(i) and signed and sealed by a Certified Industrial Hygienist, who shall possess a valid certificate from the American Board of Industrial Hygiene. A copy of the WCP shall be made available at the construction site for review by all employees and interested parties.
- H. Housekeeping: In accordance with 29 CFR 1926.62 (h), clean accumulations of dust or debris containing lead daily and conduct all cleaning with HEPA-filtered vacuums. Containerize the debris for proper disposal. Apply hazardous waste labels to drums containing dust and debris. If testing indicates that these materials are non-RCRA hazardous, re-label drums as non-hazardous and furnish testing records supporting this determination to the Engineer.

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

- I. Employee Training and Information: In accordance with 29 CFR 1926.62 (I), provide initial and annual refresher site-specific training for all employees who may perform Work specified under this Section. Contractor shall ensure at all times that no visible emissions occur when performing Work on surfaces coated with LCP (i.e., welding, cutting, drilling, torching, grinding and installing clamps).

3.02 PROTECTION

- A. Occupant protection: Renovator must post signs clearly defining the work area and warning occupants and other persons not involved in renovation activities to remain outside of the work area. To the extent practicable, these signs must be in the primary language of the occupants. These signs must be posted before beginning the renovation and must remain in place and readable until the renovation and the post-renovation cleaning verification have been completed. If warning signs have been posted in accordance with 24 CFR 35.1345(b)(2) or 29 CFR 1926.62(m), additional signs are not required by this section.

3.03 PREPARATION

- A. Containing the work area. Before beginning the renovation, the renovator must isolate the work area so that no dust or debris leaves the work area while the renovation is being performed. In addition, the firm must maintain the integrity of the containment by ensuring that any plastic or other impermeable materials are not torn or displaced, and taking any other steps necessary to ensure that no dust or debris leaves the work area while the renovation is being performed. The firm must also ensure that containment is installed in such a manner that it does not interfere with occupant and worker egress in an emergency.

3.04 WORK PRACTICES

- A. General: Perform renovation of LBP coated materials in compliance with the following requirements:
 1. Restrict access to Work Area to essential personnel.
 2. Use moist-removal methods where applicable.
 3. Remove contaminated clothing and personal protective equipment before leaving the Work Area, or Work Area enclosure, as applicable.
 4. Prohibit eating, drinking, and smoking in the Work Area.
 5. Collect and contain all paint chips, debris, personal protective equipment and protective sheeting, daily. Seal in heavy duty bags or drums to prepare for proper disposal.
- B. Interior Renovations.
 1. Remove all objects from the work area, including furniture, rugs, and window coverings, or cover them with plastic sheeting or other impermeable material with all seams and edges taped or otherwise sealed.
 2. Close and cover all ducts opening in the work area with taped-down plastic sheeting or other impermeable material.
 3. Close windows and doors in the work area. Doors must be covered with plastic sheeting or other impermeable material. Doors used as an entrance to the work area must be covered with plastic sheeting or other impermeable

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

material in a manner that allows workers to pass through while confining dust and debris to the work area.

4. Cover the floor surface, including installed carpet, with taped-down plastic sheeting or other impermeable material in the work area 6 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to contain the dust, whichever is greater. Floor containment measures may stop at the edge of the vertical barrier when using a vertical containment system consisting of impermeable barriers that extend from the floor to the ceiling and are tightly sealed at joints with the floor, ceiling and walls.
5. Use precautions to ensure that all personnel, tools, and other items, including the exteriors of containers of waste, are free of dust and debris before leaving the work area.

B. Exterior Renovations.

1. Close all doors and windows within 20 feet of the renovation. On multi-story buildings, close all doors and windows within 20 feet of the renovation on the same floor as the renovation, and close all doors and windows on all floors below that are the same horizontal distance from the renovation.
2. Ensure that doors within the work area that will be used while the job is being performed are covered with plastic sheeting or other impermeable material in a manner that allows workers to pass through while confining dust and debris to the work area.
3. Cover the ground with plastic sheeting or other disposable impermeable material extending 10 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to collect falling paint debris, whichever is greater, unless the property line prevents 10 feet of such ground covering. Ground containment measures may stop at the edge of the vertical barrier when using a vertical containment system.
4. If the renovation will affect surfaces within 10 feet of the property line, the renovation firm must erect vertical containment or equivalent extra precautions in containing the work area to ensure that dust and debris from the renovation does not contaminate adjacent buildings or migrate to adjacent properties. Vertical containment or equivalent extra precautions in containing the work area may also be necessary in other situations in order to prevent contamination of other buildings, other areas of the property, or adjacent buildings or properties.

3.05 POST RENOVATION CLEANING

A. For Interior and Exterior Renovations:

1. Collect all paint chips and debris and, without dispersing any of it, seal this material in a heavy-duty bag.
2. Remove the protective sheeting. Mist the sheeting before folding it, fold the dirty side inward, and either tape shut to seal or seal in heavy-duty bags. Sheeting used to isolate contaminated rooms from non-contaminated rooms

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

must remain in place until after the cleaning and removal of other sheeting.
Dispose of the sheeting as waste.

- B. Additional Cleaning for Interior Renovations:
 - 1. Clean all objects and surfaces within project area, and two feet beyond, per the methods detailed below, always cleaning higher to lower.
 - 2. Thoroughly vacuum all remaining surfaces and objects in the work area including furniture and fixtures, with a HEPA vacuum. The HEPA vacuum must be equipped with a beater bar when vacuuming carpets and rugs.
 - 3. Wipe all remaining surfaces and objects in the area, except for carpeted and upholstered surfaces with a damp cloth. Mop uncarpeted floors thoroughly, using a mopping method that keeps the wash water separate from the rinse water, such as the 2-bucket mopping method or using a wet mopping system. Properly contain all wash water for testing to determine if it is hazardous. Dispose wash water as Hazardous Waste if testing indicates that it is hazardous. If testing indicates that it is non-hazardous filter for particulates and dispose of in a sanitary drain. Do not dispose of wash water in storm drains.

3.06 POST RENOVATION CLEANING VERIFICATION

- A. After cleanup is complete a Certified Renovator must perform a visual inspection of the work area(s).
- B. A certified EPA Certified Lead Inspector or Risk Assessor, hired by the Owner, must be also present during the visual inspection.
- C. For Interior Renovations:
 - 1. A certified renovator with Owner's EPA Lead Inspector or Risk Assessor, must perform a visual inspection to determine whether dust, debris or residue is still present. If dust, debris or residue is present, these conditions must be removed by re-cleaning and another visual inspection must be performed.
 - 2. For Interior Renovations. After a successful visual inspection, a certified renovator must:
 - a. Verify that each windowsill in the work area has been adequately cleaned, using the following procedure.
 - (1) Wipe the windowsill with a wet disposable cleaning cloth that is damp to the touch. If the cloth matches or is lighter than the cleaning verification card, the windowsill has been adequately cleaned.
 - (2) If the cloth does not match and is darker than the cleaning verification card, re-clean the windowsill as directed in paragraphs, then either use a new cloth or fold the used cloth in such a way that an unused surface is exposed, and wipe the surface again. If the cloth matches

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

or is lighter than the cleaning verification card, that windowsill has been adequately cleaned.

- (3) If the cloth does not match and is darker than the cleaning verification card, wait for 1 hour or until the surface has dried completely, whichever is longer.
 - (4) After waiting for the windowsill to dry, wipe the windowsill with a dry disposable cleaning cloth. After this wipe, the windowsill has been adequately cleaned.
- b. Wipe uncarpeted floors and countertops within the work area with a wet disposable cleaning cloth. Floors must be wiped using an application device with a long handle and a head to which the cloth is attached. The cloth must remain damp at all times while it is being used to wipe the surface for post-renovation cleaning verification. If the surface within the work area is greater than 40 square feet, the surface within the work area must be divided into roughly equal sections that are each less than 40 square feet. Wipe each such section separately with a new wet disposable cleaning cloth. If the cloth used to wipe each section of the surface within the work area matches the cleaning verification card, the surface has been adequately cleaned.
- (1) If the cloth used to wipe a particular surface section does not match the cleaning verification card, re-clean that section of the surface, then use a new wet disposable cleaning cloth to wipe that section again. If the cloth matches the cleaning verification card, that section of the surface has been adequately cleaned.
 - (2) If the cloth used to wipe a particular surface section does not match the cleaning verification card after the surface has been re-cleaned, wait for 1 hour or until the entire surface within the work area has dried completely, whichever is longer.
 - (3) After waiting for the entire surface within the work area to dry, wipe each section of the surface that has not yet achieved post-renovation cleaning verification with a dry disposable cleaning cloth. After this wipe, that section of the surface has been adequately cleaned.
- D. For Exterior Renovations. A certified renovator must perform a visual inspection to determine whether dust, debris or residue is still present on surfaces in and below the work area, including windowsills and the ground. If dust, debris or residue is present, these conditions must be eliminated and another visual inspection must be performed. When the area passes the visual inspection, remove the warning signs. A certified EPA Certified Lead Inspector or Risk Assessor, hired by the Owner, must be also present during the visual inspection.

3.07. Post-cleanup Clearance Dust Wipe Procedures

- A. General Procedures.

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

1. Clearance samples must be performed by an EPA Certified Lead Inspector or Risk Assessor, hired by the Owner.
2. The clearance levels for lead in dust are 10 µg/ft² for floors, 100 µg/ft² for interior window sills, and 250 µg/ft² for window troughs (or well).
3. Clearance sampling must follow all EPA and ASTM Standard E 1728 sampling methodologies, using documented methodologies that incorporate adequate quality control procedures.
4. All samples must be submitted to a laboratory recognized for analysis of lead in dust by the EPA's National Lead Laboratory Accreditation Environmental Lead Laboratory Accreditation Program (ELLAP), operated by the AIHA Laboratory Accreditation Programs (AIHA).
5. The Lead Inspector or Risk Assessor shall notify the Owner and renovator of the results of laboratory tests, in writing, as soon as they are received, so residents can reoccupy the clearance area as soon as possible if clearance is achieved, or recleaning can be started quickly if dust-lead levels exceed applicable standards.

B. For Interior Renovations:

1. Dust samples for clearance purposes shall be taken a minimum of one (1) hour after completion of final post-renovation cleanup activities.
3. The following post-cleanup clearance activities shall be conducted as appropriate based upon the extent or manner of renovation activities conducted in or to the residential dwelling or child-occupied facility:
 - a. One dust sample shall be taken from one interior window sill and from one window trough (if present) and one dust sample shall be taken from the floors of each of no less than four rooms (or classrooms in school buildings), hallways or stairwells within the work area. In addition, one dust sample shall be taken from the floor outside the work area. If there are less than four rooms, hallways or stairwells within the work area, then all rooms, hallways or stairwells shall be sampled.
4. The rooms, hallways or stairwells selected for sampling shall be selected according to documented methodologies.
5. The certified inspector or risk assessor shall compare the residual lead level (as determined by the laboratory analysis) from each single surface dust sample with clearance levels for lead in dust on floors, interior window sills, and window troughs (or wells). If the residual lead level in a single surface dust sample equals or exceeds the applicable clearance level the components represented by the failed sample shall be recleaned and retested.

C. For Exterior Renovations:

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

1. Following an exterior renovation, a visible inspection shall be conducted. All horizontal surfaces in the outdoor (living) area closest to the surface affected by the work shall be found to be cleaned of visible dust and debris. In addition, a visual inspection shall be conducted to determine the presence of paint chips on the dripline or next to the foundation below any exterior surface in the work area. If paint chips are present, they must be removed from the site and properly disposed of, according to all applicable Federal, State and local requirements.
 - D. Contractor is responsible for re-cleaning any areas that do not pass applicable cleaning verification standards. The Owner or Owners Consultant (Lead Inspector or Risk Assessor) may dictate the method of cleaning to reach clearance.
 - E. After clearance has been achieved, any related construction work that does not disturb a surface with lead-based paint, such as painting surfaces which have already been prepared, can be completed (all work that does disturb painted surfaces or that could generate leaded dust should be completed as part of the lead hazard control effort). If any additional paint-disturbing work is to be done in the work area, there should be another final clearance examination after such work to assure that the space is safe for occupancy.
- 3.08 ON-SITE MANAGEMENT, TRANSPORTATION, AND DISPOSAL OF PAINT DEBRIS AND ANY OTHER WASTE GENERATED FROM THE WORK
- A. Waste from renovation activities must be contained to prevent releases of dust and debris before the waste is removed from the work area for storage or disposal. If a chute is used to remove waste from the work area, it must be covered.
 - B. At the conclusion of each work day and at the conclusion of the renovation, waste that has been collected from renovation activities must be stored under containment, in an enclosure, or behind a barrier that prevents release of dust and debris out of the work area and prevents access to dust and debris.
 - C. When the firm transports waste from renovation activities, the firm must contain the waste to prevent release of dust and debris.
 - D. Containers: Furnish DOT-approved containers of the appropriate size and type for the waste generated including, but not limited to, paint chips and protective clothing. Use containers that are resistant to rust and corrosion, (painted if constructed of steel), that have tight fitting lids or covers, and which are water resistant and leak proof.
 - E. Construction Waste: Furnish containers for non-hazardous construction waste. Use containers that are free of loose debris when brought to the construction site.
 - F. Spent Solvents: Furnish DOT-approved containers for spent solvents. Do not mix spent solvents with paint debris, water or other lead contaminated waste.
 - G. Waste Handling, Packaging and Storage: Comply with 40 CFR 262 for the on-site handling, packaging and storage of all waste generated by Work under this Section. Waste types shall be handled and stored, separately. At a minimum, waste types shall include LCP chips, disposable protective gear, containment material, general construction waste and liquid solvents.

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

- H. Store waste only at locations approved by the Owner, or Owner's project officer/engineer.
- I. Transport all non-hazardous construction waste from the Work areas to the designated storage area. Verify that the waste is completely covered during transportation.
- J. Maintain all drums in good operating condition with all lids and closing mechanisms intact and operational to prevent escape of debris by winds, spilling of contents and access by unauthorized personnel.
- K. Store non-hazardous waste separately from hazardous waste. Do not mix hazardous waste with non-hazardous waste. Do not mix different types of hazardous waste.
- L. Train all personnel in the proper handling of hazardous waste at the construction site in accordance with 29 CFR 1910.120, including the procedures to follow in the event of a release or spill, required notifications and methods of clean-up. Maintain all training records on-site.
- M. Labeling of Containers: Immediately label all containers of waste and paint debris to identify the contents. Label containers of paint debris as "LEAD PAINT WASTE, CONTAINS LEAD". Include the Contract number and locations. Provide similar labels on containers of other waste and debris.
- N. Waste Transportation and Disposal:
 - 1. All material, whether hazardous or non-hazardous shall be disposed in accordance with all laws, provisions and regulations. Ensure all waste is properly characterized. The result of each waste characterization (TCLP for RCRA materials) will dictate disposal requirements.
 - 2. Renovator shall ensure all waste is prepared for transport in accordance with all local, State and Federal regulations and all waste documents are completed and submitted for review by the Owner's project officer/engineer.
 - 3. Renovator shall transport waste to approved facilities.
 - 4. Contractor shall notify the Owner's project officer/engineer two days prior to removing any waste off-site.
 - 5. Cleaning of Haul Routes
 - 6. Clean waste transportation haul routes upon completion of operation at end of each hauling.

3.09 RECORDKEEPING AND REPORTING

- A. Renovator performing renovations must retain and, if requested, make available to EPA all records necessary to demonstrate compliance with this subpart for a period of 3 years following completion of the renovation. This 3-year retention requirement does not supersede longer obligations required by other provisions for retaining the same documentation, including any applicable State or Tribal laws or regulations.

Incidental Disturbance of Lead Paint – George Washington Elementary School
Toilet Room Renovations

- B. Renovator must retain all records pursuant to the Lead Renovation, Repair and Painting (RRP) Rule (Title 40, Subpart E – Residential Property Renovation) Section 745.86.

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 1. Footings.
 2. Foundation walls.
 3. Slabs-on-grade.
 4. Suspended slabs.
 5. Concrete toppings.
 6. Concrete fill for metal pan stairs and bollards.
 7. Building frame members.
 8. Underslab vapor retarder.
 9. Building walls.
 10. Insulation.

1.03 REFERENCES

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI 305R - Guide to Hot Weather Concreting; 2010.
- E. ACI 306R - Guide to Cold Weather Concreting; 2016.
- F. ACI 308R - Guide to External Curing of Concrete; 2016.
- G. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).
- H. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- I. ASTM C192/C192M - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory; 2016a.
- 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 C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.

- N. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- O. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.
- P. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.
- Q. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2019a.
- R. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
- S. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
- T. ASTM D6817/D6817M - Standard Specification for Rigid Cellular Polystyrene Geofoam; 2017.
- U. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.
- V. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- W. PS 1 - Structural Plywood; 2009.
- X. ACI 350 - Concrete Sanitary Engineering Structures.
- Y. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

1.04 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.05 ACTION SUBMITTALS

- A. The contractor shall comply with the requirements of Division 01 Specification of the Project Manual, Section 013300 - SUBMITTALS.
- B. Product Data: For each type of product indicated.
- C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
 - 2. Submit mix design mixtures for each type of concrete to be used on the Project at least 30 calendar days prior to the first scheduled concrete pour. The Contractor's testing laboratory shall develop concrete mix designs and test all materials and mixes for conformance with ACI 301 and these specifications. The costs associated with development of the design mix and testing of samples shall be included in the bid price.
 - 3. Submit the following:
 - a. Name, address, and telephone number of Contractor's laboratory.
 - b. Mix proportions.
 - c. Source of cement, type, brand, and certified copies of mill reports, including physical and chemical analysis.

- d. Sources of fine aggregates and results of test made in accordance with ASTM C33/C33M and ASTM C40.
 - e. Source of coarse aggregates and results of tests made in accordance with ASTM C33/C33M.
 - f. Catalog cuts of all admixtures.
 - g. Furnish test results of slump, air entrainment and water-cement ratio for each mix design.
4. For each mix proposed, make and cure four (4) standard 6 inch concrete test specimens to the laboratory in accordance with ASTM C192/C192M. Furnish compression test results made in accordance with ASTM C39/C39M. Break two (2) cylinders at seven (7) days and two (2) at 28 days.
 5. If the concrete is intended to be pumped, design mix accordingly and submit certification that it has been tested for pumping.
 6. If adopted mix fails to produce concrete meeting the requirements for strength and placibility, the Architect may order additional cement or adjustments to mix proportions at no extra cost to the Owner.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, spacing, locations, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement including steel bars and wire fabric.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer licensed in the state where the project is located; detailing fabrication, assembly, and support of formwork. Shop drawings shall bear the signature and seal of the same licensed Professional Engineer.
1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal
 2. Shop drawings shall indicate formwork dimensioning, materials and arrangement of joints and ties.
 3. Manufacturer's instructions: Indicate installation procedure and interface required with adjacent work
- F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect, if not shown on the drawings.
- G. Samples: For waterstops and vapor retarder.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, provided by manufacturers:
 1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Curing compounds.
 6. Bonding agents.
 7. Adhesives and Vapor retarders.
 8. Semi rigid joint filler.

9. Joint-filler strips.
 10. Repair materials.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
 - E. Field quality-control reports.
 - F. Minutes of preinstallation conference.
 - G. Furnish transit-mix delivery slips to Owner's Representative.

1.07 QUALITY ASSURANCE

- A. Comply with Referenced Standards specified in Division 01 Section "References" in addition to ACI 301.
- B. Perform testing under the provisions of Division 01 Section "Quality Requirements" and the "FIELD QUALITY CONTROL" Article of Part 3 listed in this specification.
- C. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- E. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 1. The contractor shall provide an adequately sized, insulated curing box to house concrete cylinders at the discretion of the Architect, for the 48-hour period between concrete pour and sample collection pick-up by the Testing Laboratory (ASTM C31/C31M). As directed by the Architect, the contractor shall cure additional cylinders in the same fashion as the in-place concrete.
 2. Curing box shall be located away from the main construction area and shall be blocked up off the ground.
 3. A log sheet shall be provided in a waterproof sheet protector to log in the placement and removal of the concrete test samples by the testing laboratory.
 4. Minimum information to be logged for each pour date shall include: date of pour, date of pick-up, weather conditions at the time of pour, testing
- F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer. To further insure consistency, coloration, finish and quality; all aggregates, cement, water and other ingredients shall each be secured from the same source for the duration of the project.
 1. The batching plant and raw materials may be subject to inspections and test performed by the Architect.
- G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

- H. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete", Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
 - 3. ACI 304R - "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
- I. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- J. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi rigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Store cement off the ground in a dry, weatherproof, adequately ventilated structure with provisions to prevent the absorption of water.
- C. Transport dry concrete batches from the central plant to the site in approved truck mixers conforming to the requirements of the Truck Mixer Manufacturer's Agitating Standards. Each truck shall contain a plate stating the capacity, drum speeds and be provided with a revolution counter.
- D. Packaged material shall be delivered and stored in the original packages until ready for use. Packages or materials showing evidence of water or other damage shall be rejected.
- E. Protect all materials from freezing.

1.09 COORDINATION

- A. Coordinate work under provisions of Division 01 Specification of this Project Manual.
- B. The Contractor shall provide at least five (5) working days advance notice prior to formwork closure to the Architect.
- C. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- D. Notify Architect a minimum of three (3) working days prior to commencement concrete pours.

1.10 REGULATORY REQUIREMENTS

- A. Conform to ACI 304R and all applicable codes for placement of concrete and related work.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when the ambient temperature is below 40 deg. F. or when the concrete temperature exceeds 85 deg. F. Under certain circumstances, the Engineer may approve the placement of concrete under the above conditions, provided that the procedures of ACI 305R and ACI 306R are strictly adhered to.
- B. Do not place concrete when the conditions may adversely affect the placing, curing or finishing of concrete, or its strength.
- C. Comply with the requirements contained in Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Steel forms: Minimum 16 gage thick, stiffened to support weight of concrete with minimum deflection.
 - 3. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Douglas Fir Species, solid one side grade and sound
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum unless indicated otherwise on the drawings.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal. Patterns and sizes as shown on the drawings.
- E. Form-Release Agent: Commercially formulated, colorless, water based, non-toxic, V.O.C. compliant, environmentally safe material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete; manufactured by DAYTON SUPERIOR or equal. Agent shall not be detrimental to the environment.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. For Concrete Tanks: Furnish snap-ties with 1 inch plastic cone and waterseal washer.

2.02 PERMANENT PREFABRICATED EPS FOAM PANEL FORMWORK

A. Manufacturers:

1. LiteForm Technologies, LLC; LiteDeck WRS: www.liteform.com.
2. b-foam GEOFOAM-GRADE EPS: PT BETON WORKS: www.b-foam.com/geofoam.
3. Insulfoam GF (Geofoam)
4. Engineer approved equivalent.

- B. Floor Deck Forms: Pre-engineered expanded polystyrene foam plastic blocks in sizes and shapes required to infill the irregularly shaped areas indicated and verified by the contractor by field measurements. Shop drawings shall be produced based upon field verifications. Forms shall be installed to allow for the installation of a poured reinforced concrete slab as indicated on the drawings. EPS foam shall be Fire-retardant (FR) and shall conform to ASTM D6817/D6817MASTM D6817. EPS foam shall have the following Physical characteristics:

TYPE	EPS12	EPS15	EPS19	EPS 22	EPS29	EPS39	EPS46
Density, min. pcf	0.70	0.90	1.15	1.35	1.80	2.40	2.85
Compressive Resistance at 1%, psi	2.2	3.6	5.8	7.3	10.9	15.0	18.6
Compressive Resistance at 5%, psi	5.1	8.0	13.1	16.7	24.7	35.0	43.5
Compressive Resistance at 10%, psi	5.8	10.2	16.0	19.6	29.0	40.0	50.0
Flexural strength min., psi	10.0	25.0	30.0	30.0	50.0	60.0	75.0
Elastic Modulus (min.), psi	220	360	580	730	1090	1500	1860

C. Expanded Polystyrene (EPS) Insulation Board: ASTM C578, Type VIII.

1. Density: See chart above.
2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
4. Oxygen Index, Volume %: 24.0 min.
5. Dimensional Stability, maximum %: <2%.
6. Poisson's Ratio: 0.05.
7. Coefficient of Friction: 0.6
8. Absorption, volume %: <4.0%

2.03 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- B. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- C. Galvanized Reinforcing Bars: ASTM A615/A615M, Grade 60; ASTM A706/A706M, deformed bars; ASTM A767/A767M, Class II zinc coated after fabrication and bending.
- D. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 ; ASTM A706/A706M, deformed bars, assembled with clips.
- E. Deformed-Steel Wire: ASTM A 496.

- F. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.04 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. Provide load bearing pad on bottom to prevent vapor barrier puncture.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. Provide load bearing pad on bottom to prevent vapor barrier puncture.

2.05 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C150/C150M, Type IA, gray. Supplement with the following:
 - a. Fly Ash: ASTM C618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C989/C989M, Grade 100 or 120.
 - 2. Silica Fume: ASTM C1240, amorphous silica.
 - 3. Normal-Weight Aggregates: ASTM C33/C33M, No. 57 or 67 crushed stone coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - a. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 - b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - 4. Lightweight Aggregate: ASTM C330/C330M, 3/4 inch, nominal maximum aggregate size.
 - 5. Water: ASTM C94/C94M, clean and not detrimental to concrete.

2.06 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.07 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E1745, Class C or polyethylene sheet, ASTM D4397 not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400
 - b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120
 - c. Insulation Solutions, Inc.; Viper VaporCheck 10.
 - d. Meadows, W. R., Inc.; Perminator 10 mil.
 - e. Reef Industries, Inc.; Griffolyn 10 mil Green.
 - f. Stego Industries, LLC; Stego Wrap 10 mil Class A.
 - g. Or approved equal.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C33/C33M for fine aggregates.

2.08 FLOOR AND SLAB TREATMENTS

- A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 4 sieve.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dayton Superior Corporation; Emery Tuff Non-Slip
 - b. Lambert Corporation; EMAG-20
 - c. L&M Construction Chemicals, Inc.; Grip It
 - d. Metalcrete Industries; Metco Anti-Skid Aggregate

2.09 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 8 oz. /sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet weighing approximately 8 oz. / sq. yd. bonded to prevent separation during use.
- C. Membrane curing compound: Moisture Retention complying with ASTM C309. Products: EUCOCURE VOX by Euclid Chemical Company or equal.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
1. Products: Eucocure VOX as manufactured by Euclid Chemical Company or approved equal.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, 1/2" asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

- C. Epoxy Bonding Adhesive: three-component, solvent-free, moisture tolerant, epoxy modified cementitious product.
 - 1. Product: Armatec 110 EpoCem as manufactured by Sika Corporation or specifically approved equal.
 - 2. Types I and II, non-load bearing Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Non-Shrink Grout: Premixed compound, free of chlorides, with non-metallic aggregate, cement water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi at 48 hours and 7000 psi at 28 days. Grout shall be suitable for contact with potable water. For equipment bases and pipe supports, use non-shrink grout by Master Builders, Embeco 636, Unisorb V-1 or equal.
- E. Reglets: Fabricate reglets of galvanized-steel sheet not less than 26 gauge material; in the longest lengths possible with alignment splines for joints; secure to formwork; Type CO as manufactured by Fry Reglet or approved equal. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inches (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- G. Extrudable Strip Waterstop: One part polyurethane, extrudable swelling waterstop to create a compression seal; SikaSwell S-2 as manufactured by Sika Corp. or specifically approved equal.
- H. Field Applied Waterstop Grout: Krystol Waterstop Grout, crystalline grout to be applied in accordance with the manufacturer's specifications at joints and penetrations. Manufacturer: Kryton International Inc. (800)267-8280 or approved equal.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C109/C109M.

2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.

4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent Portland cement minimum, with fly ash or Pozzolan not exceeding 25 percent.
 5. Silica Fume: 10 percent.
 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 8. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: Pier, Mat and Spread Footings; foundation walls, slab on grade and slab on metal deck: 4000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.50 for all concrete building elements.
 3. Slump Limits (Conventional Mix):
 - a. Slabs: 3 inches plus or minus one inch.
 - b. Piers, Foundation Walls and Footings: 4 inches plus or minus one inch.
 4. Slump Limits (Pump Mix):
 - a. Final slump (Slabs): 6 1/2 inches plus or minus one inch.
 - b. Final Slump (Foundation, walls and footings): 7 1/2 inches plus or minus one inch
 5. Air Content:
 - a. Piers, Mats and Spread Footings: 5.5 percent, plus or minus 1.0 percent. at the point of delivery.
 - b. Slabs: 3 percent, plus or minus 1.0 percent at point of delivery. Do not allow air content of trowel finished concrete floors to exceed 3 percent.
 6. Large Aggregates: 3/4" crushed stone; ASTM C33/C33M, No. 67.
 7. Use Admixtures only when approved by the Engineer.
 8. Mix Grout in accordance with the manufacturer's instructions and specifications.
- B. All concrete for the clear-well and backwash waste tank construction shall include Krystol Internal Membrane (KIM)[®] integral water repellent admixture as manufactured by Kryton or specifically approved equal. Admixture shall be added at a rate as recommended by the approved manufacturer.

2.14 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and measurements before proceeding with formwork. Ensure that dimensions agree with the plans.
- B. Inspect the formwork and reinforcing that it has been properly set and secured and that all items to be embedded, built-in or pass through concrete are at their proper locations and elevations.
- C. The General Construction Contractor shall verify that all other prime contractors have installed concrete inserts, sleeves, and embedded elements of the project, such as conduit, and their work has been totally completed and inspected by the Architect.
- D. Ensure that all points of contact with new grout are free from oil, grease and scale.

3.02 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class B, 1/4 inch for rough-formed finished surfaces.
 - a. Hand trim sides and bottom of earth forms and remove loose soil to the satisfaction of the Architect.
 - b. Remove water from forms and excavations and divert water flow to avoid washing over, under or through freshly placed concrete.
- D. Construct forms tight enough to prevent loss of concrete mortar. Align form joints.
- E. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.

2. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer: Provide 3/4" inch chamfer on all exterior horizontal and vertical corners and edges of permanently exposed concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.
- N. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-metallic/ non-shrink grout.
- O. Prepare previously placed concrete by cleaning with steel brush and apply a Bonding Agent in accordance with the manufacturer's specifications and instructions.

3.03 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 3. Install dovetail anchor slots in concrete structures as indicated.
 4. Ensure that all inserts and embedded items are not disturbed during concrete placement.

3.04 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.05 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.06 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions.
 1. Lap joints 6 inches and seal with manufacturers recommended tape.
- B. Granular Course: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

3.07 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars. Use reinforcing splices at minimum of locations and only at locations of minimum stress. Review locations of splices with Architect. Splice locations shall be approved during shop drawing review phase. Rebar splice overly shall be the minimum length as per ACI 318.
 1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

- F. Take necessary measures to ensure that reinforcement is not disturbed during the placement of concrete.

3.08 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated or at 20' o.c. maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction / Control Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Sawn Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 3/16"-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 - JOINT SEALANTS are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- F. Ensure joint fillers and devices are not disturbed during placement of concrete.
- G. Install all joint fillers and devices in accordance with the manufacturer's instructions and specifications for floor and wall finish.
- H. Install joint device anchors. Maintain correct position to allow joint cover flush with floor and wall finish.
- I. Install joint covers in one-piece length when adjacent construction activity is complete.

- J. Apply sealants in joint devices in accordance with the manufacturer's specifications and instructions.

3.09 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
 - 2. Place concrete with the aid of mechanical vibrators which are capable of transmitting to the concrete not less than 3,000 impulses per minute. Maintain at least three (3) vibrators in good working condition, ready for use when concrete placement begins in any one area.
 - 3. Do not interrupt successive placement. Do not permit cold joints to occur.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- G. Hot-Weather Placement: Comply with ACI 301 and ACI 305R and as follows:
1. Maintain concrete temperature below 95 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
 3. Maintain records of concrete placement. Record date, locations, quantity, air temperature and test samples taken.
 4. In areas with floor drains, maintain floor elevations at walls; pitch surfaces uniformly to the drains maintaining a 1% slope.
 5. Cure floor surfaces in accordance with ACI 308R.
 6. Apply curing compound in accordance with the manufacturer's specifications and instructions in two (2) coats with the second coat at right angles to the first.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch 6 mm in one direction.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, and ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F (F) 30; and of levelness, F (L) 20; with minimum local values of flatness, F (F) 24; and of levelness, F (L) 15; for suspended slabs.
 3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. This surface shall be used for interior and exterior walking surfaces unless noted otherwise. Finish edges of exterior walkway flags with steel tooled radius edge.
 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, equipment pads, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb. /100 sq. ft. of dampened slip-resistive over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 2. After broadcasting and tamping, apply float finish.
 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aluminum granules.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. All exposed horizontal and vertical wall and slab corners shall have a 3/4" wide chamfered edge.
- D. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 6 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.

3. Minimum Compressive Strength: 4000 psi at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 12 inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 7. Cast anchor-bolt inserts into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
- E. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.
- F. Grout: Install grout in accordance with the manufacturer's specifications and instructions. Moisten concrete and grout surfaces and allow drying until damp. Remove all standing water. Pump or inject grout into tight spaces to ensure intimate contact with the existing grout. Cure grout with an appropriate membrane in accordance with the manufacturer's specifications and instructions.

3.13 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 and ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb./sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308R and ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

- c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
- 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
- F. Liquid sealer/hardener to be applied on exposed concrete cured with moisture retentive or absorptive covers. The following materials provide varying levels of protection, sealant and hardness. Review products for project appropriateness.
 - 1. Euclid: Euco Diamond Hard (Liquid Sealer and Hardener)
 - 2. L&M Construction Chemicals: Seal Hard (Liquid Sealer and Hardener)
 - 3. Curecrete Chemical Company: Ashford Formula (Liquid Sealer and Hardener)
 - 4. Midwest Floor Care: Structure Formula (Liquid Sealer and Hardener)
 - 5. Or approved equal.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least three month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Immediately remove all rust spots that have developed during the construction period as soon as directed by the Architect. Remove all rust spots that have formed by the use of temporary handrails.

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and/or qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Contractor is responsible to notify the Owners representative at least 72 hours prior to the scheduled work that requires inspection / testing. The presence of the Inspector engaged by the Owner does not relieve the contractor of Quality Control Requirements.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Headed bolts and studs.

3. Steel reinforcement welding.
 4. Concrete placement, including conveying and depositing.
 5. Curing procedures and maintenance of curing temperature.
 6. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. Frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - b. One (1) additional test cylinder shall be taken during cold weather and be cured under the same conditions as the concrete it represents.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C173/C173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C31/C31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two Insert number sets of two standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C39/C39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28-day tests.
 11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E1155 within 72 hours of finishing.

END OF SECTION 033000

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Liquid-applied self-leveling floor underlayment.
 - 1. Cementitious type._____.

1.02 RELATED REQUIREMENTS

- A. Section 017000 - Execution and Closeout Requirements: Alteration project procedures; selective demolition for remodeling.

1.03 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; 2019b.
- 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.

1.04 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.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.06 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).

1.07 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/Engineer.
 - 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/Engineer.
- B. Mock-up may remain as part of the Work.

1.08 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 maintenance of unit masonry consisting of brick clay masonry restoration and cleaning as follows:
 - 1. Unused anchor removal.
 - 2. Repairing unit masonry, including replacing units.
 - 3. Painting steel uncovered during the work.
 - 4. Re-anchoring veneers.
 - 5. Repointing joints.
 - 6. Preliminary cleaning, including removing plant growth.
 - 7. Cleaning exposed unit masonry surfaces.

1.03 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."
 - 1. Unit prices apply to authorized work covered by quantity allowances.

1.04 DEFINITIONS

- A. Very Low-Pressure Spray: Under 100 psi (690 kPa).
- B. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- C. Medium-Pressure Spray: 400 to 800 psi (2750 to 5510 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- D. High-Pressure Spray: 800 to 1200 psi (5510 to 8250 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- E. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.05 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on masonry units as follows.
 - 1. Existing Brick: Test each type of existing masonry unit indicated for replacement, according to testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction). Carefully remove existing units from locations designated by Architect. Take testing samples from these units.
 - 2. Replacement Brick: Test each proposed type of replacement masonry unit, according to sampling and testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).
- B. Mortar Analysis Test: The Contractor shall take two (2) (1/2 cup min.) samples of existing mortar from building joint areas approved by the Owner. Mortar shall be sent in closed protective containers to one of the laboratories listed herein and analyzed. Analysis shall consist of, but not be limited to, the following tests: Wet Chemical/Gravimetric Analysis &

Examination, Chemical Dissolution, Aggregate Separation, and Sieve Mesh Analysis. All tests shall be completed in conformance with the latest applicable ASTM Standard(s). Test results shall include a detailed list of materials to make an exact replica of the existing mortar including strength, material composition, sources, color, and texture. Results shall include aggregate identification/source(s) and characteristics; binder to aggregate ratio and probable original mix based on lab analysis and historical investigations. Based upon the findings of the mortar analysis, the Contractor shall prepare two samples of the mortar for selection by the Architect and the Owner prior to the production of Mortar utilized for the project. Contractor shall have testing shall be performed at one of the following testing labs:

1. Jablonski Berkowitz Conservation Inc. (certified WBE)
40 W. 27th St., Suite 1201
NY, NY 10001
(212) 532-7775
2. ICR (Integrated Conservation Resources)
32 Old Slip
NY, NY 10005
(212) 947-4499
3. BCA (Building Conservation Associates)
44 E 32nd St.
NY, NY 10016
(212) 777-1300
4. Wiss, Janney, Elstner
330 Pfingsten Road
Northbrook, IL 60062-2095
(847) 272-7740

1.06 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- B. Samples for Verification: For the following:
 1. Each type of masonry unit to be used for replacing existing units. Include sets of Samples as necessary to show the full range of shape, color, and texture to be expected.
 - a. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.
 2. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches (150 mm) long by 1/4 inch (6 mm) (13 mm) wide, set in aluminum or plastic channels.
 - a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.

1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For including field supervisors and restoration workers and testing service.
- B. Restoration Program.
- C. Cleaning Program.

1.08 QUALITY ASSURANCE

- A. Restoration Specialist Qualifications: Engage an experienced, preapproved masonry restoration and cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of

successful in-service performance. Experience installing standard unit masonry is not sufficient experience for masonry restoration work.

1. At Contractor's option, work may be divided between two specialist firms: one for cleaning work and one for repair work.
 2. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress. Supervisors shall not be changed during Project except for causes beyond the control of restoration specialist firm.
 3. Restoration Worker Qualifications: Persons who are experienced and specialize in restoration work of types they will be performing.
 4. Masonry cleaning and repair work shall conform to National Park Service Preservation Briefs #1 and #2.
- B. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- C. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.
- D. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage due to worker fatigue.
- E. Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials and Project site.
1. Include methods for keeping pointing mortar damp during curing period.
 2. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.
- F. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.
1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.
- G. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet (6 m) away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.
- H. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.
1. Repointing: Rake out joints in 2 separate areas, each approximately 36 inches (900 mm) high by 48 inches (1200 mm) wide for each type of repointing required and repoint one of the areas.

2. Cleaning: Clean an area approximately 25 sq. ft. (2.3 sq. m) for each type of masonry and surface condition.
 - a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use cleaners and methods known to have deleterious effect.
 - b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
 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.
- I. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to masonry restoration and cleaning including, but not limited to, the following:
 - a. Construction schedule. Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.
- B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- E. Store lime putty covered with water in sealed containers.
- F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.
- B. Repair masonry units and repoint mortar joints only when air temperature is between 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.
- C. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
 1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F (4 and 49 deg C).
 2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 7 days after repair and pointing.

- D. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above unless otherwise indicated.
- E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.
- F. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.11 COORDINATION

- A. Coordinate masonry restoration and cleaning with public circulation patterns at Project site. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.12 SEQUENCING AND SCHEDULING

- A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.
- B. Order sand and gray Portland cement for pointing mortar immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity to complete Project.
- C. Perform masonry restoration work in the following sequence:
 1. Remove plant growth.
 2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 3. Remove paint.
 4. Clean masonry surfaces.
 5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 6. Repair masonry, including replacing existing masonry with new masonry materials.
 7. Rake out mortar from joints to be repointed.
 8. Point mortar and sealant joints.
 9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
 10. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
- D. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to comply with "Masonry Unit Patching" Article. Patch holes in mortar joints to comply with "Repointing Masonry" Article.

PART 2 - PRODUCTS

2.01 MASONRY MATERIALS

- A. Face Brick: Provide face brick, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work matching existing masonry.
 1. Provide units with colors, color variation within units, surface texture, size, and shape to match existing brickwork.

- a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.
 2. Special Shapes:
 - a. Provide specially molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position and where shapes produced by sawing would result in sawed surfaces being exposed to view.
 - b. Provide specially ground units, shaped to match patterns, for arches and where indicated.
 - c. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are not acceptable procedures for fabricating special shapes.
 3. Tolerances as Fabricated: Comply with tolerance requirements in ASTM C 216, Type FBS or to match existing brick masonry tolerances.
- B. Salvaged Brick: When available, obtain salvaged brick from Owner from location shown on Drawings. Clean off residual mortar prior to re-use.
- C. Brick Staining: Custom blended hand applied emulsion to match existing brick masonry palette utilizing Nawkaw Emulsion Color Treatment NECT-90 as manufactured by NawKaw Corporation (1-905-542-7893) or approved equal.

2.02 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, white or gray or both where required for color matching of exposed mortar.
1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Sand: ASTM C 144 unless otherwise indicated.
1. Color: Provide natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
 2. For pointing mortar, provide sand with rounded edges.
 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
- D. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.
- E. Mortar Staining: Nawkaw Corporation - NECT-90 Nawkaw emulsion color treatment or approved equal.
- F. Water: Potable.

2.03 MANUFACTURED REPAIR MATERIALS

- A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Cathedral Stone Products, Inc.; M70 Limestone, Sandstone, and Brownstone Repair and Jahn M100 Terra Cotta and Brick Repair Mortar.
 - b. Or approved equal.
 2. Use formulation that is vapor- and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.

3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
4. Formulate patching compound used for patching brick in colors and textures to match each masonry unit being patched. Provide sufficient number of colors to enable matching the color, texture, and variation of each unit.

2.04 PAINT REMOVERS

- A. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste formulation for removing paint coatings from masonry.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. PROSOCO; Enviro Klean Safety Peel 2.
 - b. Or approved equal.

2.05 CLEANING MATERIALS

- A. Water: Potable.
- B. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate, 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.
- C. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate, 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gal. (20 L) of solution required.
- D. Nonacidic Gel Cleaner: Manufacturer's standard gel formulation, with pH between 6 and 9 that contains detergents with chelating agents and is specifically formulated for cleaning masonry surfaces.
- E. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. PROSOCO; Enviro Klean 2010 All Surface Cleaner.
 - b. Or Approved Equal.

2.06 ACCESSORY MATERIALS

- A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. PROSOCO; Sure Klean Strippable Masking.
 - b. Or Approved Equal.
- B. Masonry Repair Anchors, Spiral Type: Type 304 stainless-steel spiral rods designed to anchor to backing and veneer. Anchors are flexible in plane of veneer but rigid perpendicular to it.
 1. Provide driven-in anchors designed to be installed in drilled holes and relying on screw effect rather than adhesive to secure them to backup and veneer.
 2. Products: Subject to compliance with requirements, provide the following:
 - a. Heckmann Building Products Inc.; #391 Remedial Tie.
 - b. Hohmann & Barnard, Inc.; Helix Spiro-Ties.
 - c. Or approved equal.
- C. Sealant Materials:

1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 - JOINT SEALANTS.
 - a. Single-component, non-sag urethane sealant.
 2. Colors: Provide colors of exposed sealants to match colors of masonry adjoining installed sealant unless otherwise indicated.
- D. Joint-Sealant Backing:
1. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 2. 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 where such adhesion would result in sealant failure. Provide self-adhesive tape where acceptable.
- E. Setting Buttons: Resilient plastic buttons, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.
- F. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.
- G. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.
1. Use coating requiring no better than SSPC-SP 3, "Power Tool Cleaning" surface preparation according to manufacturer's literature or certified statement.
 2. Use coating with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- H. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:
1. Previous effectiveness in performing the work involved.
 2. Little possibility of damaging exposed surfaces.
 3. Consistency of each application.
 4. Uniformity of the resulting overall appearance.
 5. Do not use products or tools that could do the following:
 - a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
 - b. Leave a residue on surfaces.

2.07 MORTAR MIXES

- A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.
- B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not re-temper or use partially hardened material.

- C. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
 - 1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.
- D. Do not use admixtures in mortar unless otherwise indicated.
- E. Mortar Proportions: Mix mortar materials in the following proportions:
 - 1. Pointing Mortar for Brick: 1 part Portland cement, 2 parts lime, and 6 parts sand.
 - a. Add mortar pigments to produce mortar colors required.
 - 2. Rebuilding (Setting) Mortar: Comply with ASTM C 270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to Portland cement and lime.

2.08 CHEMICAL CLEANING SOLUTIONS

- A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.
- B. Acidic Cleaner Solution for Brick: Dilute with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended by chemical-cleaner manufacturer.

PART 3 - EXECUTION

3.01 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
 - 1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.
- B. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
 - 1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
 - 2. Keep wall wet below area being cleaned to prevent streaking from runoff.
 - 3. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
 - 4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
 - 5. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
- C. Prevent mortar from staining face of surrounding masonry and other surfaces.
 - 1. Cover sills, ledges, and projections to protect from mortar droppings.
 - 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 - 3. Immediately remove mortar in contact with exposed masonry and other surfaces.
 - 4. Clean mortar splatters from scaffolding at end of each day.

3.02 UNUSED ANCHOR REMOVAL

- A. Remove masonry anchors, brackets, wood nailers, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.
 - 1. Remove items carefully to avoid spalling or cracking masonry.
 - 2. Where directed, if an item cannot be removed without damaging surrounding masonry, do the following:
 - a. Cut or grind off item approximately 3/4 inch (20 mm) beneath surface and core drill a recess of same depth in surrounding masonry as close around item as practical.
 - b. Immediately paint exposed end of item with two coats of anti-rust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.
 - 3. Patch the hole where each item was removed unless directed to remove and replace the masonry unit.

3.03 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
 - 1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- D. Remove in an undamaged condition as many whole bricks as possible.
 - 1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
 - 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
 - 3. Store brick for reuse. Store off ground, on skids, and protected from weather.
 - 4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.
- E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Replace removed damaged brick with other removed brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.
- G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
 - 1. Maintain joint width for replacement units to match existing joints.
 - 2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 gr/30 sq. in. per min. (30 g/194 sq. cm per min.). Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.

2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.04 REANCHORING VENEERS

- A. Install masonry repair anchors in horizontal mortar joints and according to manufacturer's written instructions. Install at not more than 16 inches (400 mm) o.c. vertically and 32 inches (800 mm) o.c. horizontally unless otherwise indicated. Install at locations to avoid penetrating flashing.
- B. Recess anchors at least 5/8 inch (16 mm) from surface of mortar joint and fill recess with pointing mortar.

3.05 PAINTING STEEL UNCOVERED DURING THE WORK

- A. Inspect steel exposed during masonry removal. Where Architect determines that it is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:
 1. Remove paint, rust, and other contaminants according to SSPC-SP 3, "Power Tool Cleaning", as applicable to meet paint manufacturer's recommended preparation.
 2. Immediately paint exposed steel with two coats of anti-rust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).
- B. If on inspection and rust removal, the cross section of a steel member is found to be reduced from rust by more than 1/16 inch (1.6 mm), notify Architect before proceeding.

3.06 MASONRY UNIT PATCHING

- A. Patch the following masonry units unless another type of replacement or repair is indicated:
- B. Remove and replace existing patches unless otherwise indicated or approved by Architect.
- C. Patching Bricks:
 1. Remove loose material from masonry surface. Carefully remove additional material so patch will not have feathered edges but will have square or slightly undercut edges on area to be patched and will be at least 1/4 inch (6 mm) thick, but not less than recommended by patching compound manufacturer.
 2. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of masonry unit.
 3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
 4. Rinse surface to be patched and leave damp, but without standing water.
 5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
 6. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch (6 mm) or more than 2 inches (50 mm) thick. Roughen surface of each layer to provide a key for next layer.
 7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the masonry unit. Shape and finish surface before or after curing, as determined by testing, to best match existing masonry unit.
 8. Keep each layer damp for 72 hours or until patching compound has set.

3.07 CLEANING MASONRY, GENERAL

- A. Proceed with cleaning in an orderly manner; work from bottom to top of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.
- B. Use only those cleaning methods indicated for each masonry material and location.
 - 1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being utilized. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
 - 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
 - a. Equip units with pressure gages.
 - 3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
 - 4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
 - 5. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F (60 and 71 deg C) at flow rates indicated.
- C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.
- D. Water Application Methods:
 - 1. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
 - 2. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches (150 mm) from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.
- E. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi (345 kPa). Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.
- F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
 - 1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.
- G. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.08 PRELIMINARY CLEANING

- A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.

- B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, caulking, asphalt, and tar.
1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.
 2. Remove paint and caulking with alkaline paint remover.
 - a. Comply with requirements in "Paint Removal" Article.
 - b. Repeat application up to two times if needed.

3.09 PAINT REMOVAL

- A. Paint Removal with Alkaline Paste Paint Remover:
1. Remove loose and peeling paint using low -pressure spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
 2. Allow paint remover to remain on surface for period recommended by manufacturer.
 3. Rinse with hot water applied by low -pressure spray to remove chemicals and paint residue.
 4. Repeat process if necessary to remove all paint.
 5. Apply acidic cleaner or manufacturer's recommended afterwash to masonry, while surface is still wet, using low-pressure spray equipment or soft-fiber brush. Let cleaner or afterwash remain on surface as a neutralizing agent for period recommended by chemical cleaner or afterwash manufacturer.

3.10 CLEANING BRICKWORK

- A. Cold-Water Soak:
1. Apply cold water by intermittent spraying to keep surface moist.
 2. Use perforated hoses or other means that will apply a fine water mist to entire surface being cleaned.
 3. Apply water in cycles with at least 30 minutes between cycles.
 4. Continue spraying until surface encrustation has softened sufficiently to permit its removal by water wash, as indicated by cleaning tests.
 5. Continue spraying for 72 hours.
 6. Remove soil and softened surface encrustation from masonry with cold water applied by low-pressure spray.
- B. Cold-Water Wash: Use cold water applied by low-pressure spray.
- C. Detergent Cleaning:
1. Wet masonry with cold water applied by low-pressure spray.
 2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that masonry surface remains wet.
 3. Rinse with cold water applied by low -pressure spray to remove detergent solution and soil.
 4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.
- D. Mold, Mildew, and Algae Removal:
1. Wet masonry with hot water applied by low-pressure spray.
 2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
 3. Scrub masonry with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and

crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that masonry surface remains wet.

4. Rinse with cold water applied by medium -pressure spray to remove mold, mildew, and algae remover and soil.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

E. Nonacidic Gel Chemical Cleaning:

1. Apply non-acidic gel cleaner in 1/8-inch (3-mm) thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively so area will be uniformly covered with fresh cleaner and dwell time will be uniform throughout area being cleaned.

3.11 CLEANING BROWNSTONE AND TERRA COTTA

A. Mild Acidic Chemical Cleaning:

1. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use a steam cleaning.

3.12 REPOINTING MASONRY

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints where mortar is missing or where they contain holes.
3. Cracked joints where cracks can be penetrated at least 1/4 inch (6 mm) by a knife blade 0.027 inch (0.7 mm) thick.
4. Cracked joints where cracks are 1/16 inch (1.6 mm) or more in width and of any depth.
5. Joints where they sound hollow when tapped by metal object.
6. Joints where they are worn back 1/4 inch (6 mm) or more from surface.
7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
8. Joints where they have been filled with substances other than mortar.
9. Joints indicated as sealant-filled joints.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth of 2 times joint width, but not less than 1/2 inch (13 mm) or not less than that required to expose sound, un-weathered mortar.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
 - a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.
 - b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch (9 mm) until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
 3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch (9 mm). Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to feather edge the mortar.
 4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
 5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.
 - a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
 6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.
- F. Pointing with Sealant:
1. After raking out, keep joints dry and free of mortar and debris.
 2. Clean and prepare joint surfaces according to Section 079200 "Joint Sealants." Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
 3. Fill sealant joints with specified joint sealant according to Section 079200 "Joint Sealants" and the following:
 - a. Install cylindrical sealant backing beneath the sealant, except where space is insufficient. There, install bond-breaker tape.
 - b. Install sealant using only proven installation techniques that will ensure that sealant will be deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding masonry and matching the contour of adjoining mortar joints.
 - c. Install sealant as recommended by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:
 - d. Fill joints to a depth equal to joint width, but not more than 1/2 inch (13 mm) deep or less than 1/4 inch (6 mm) deep.
 - e. Immediately after first tooling, apply ground-mortar aggregate to sealant, gently pushing aggregate into the surface of sealant. Retool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant and aggregate from surfaces adjacent to joint.
 - f. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.
 4. Cure sealant according to Section 079200 "Joint Sealants."
- G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.13 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- C. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

END OF SECTION 040120

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. Weyerhaeuser 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 casings and moldings.
- C. 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 088000 - Glazing: Glass and glazing of wood partitions and screens.
- D. Section 099123 - Interior Painting: Painting of finish carpentry items.
- E. Section 099300 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.
- B. ANSI A208.1 - American National Standard for Particleboard; 2009.
- C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.
- G. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- H. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- I. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
- J. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
- K. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.
- L. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- M. PS 1 - Structural Plywood; 2009.
- N. PS 20 - American Softwood Lumber Standard; 2020.

- O. 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 to match existing finish.
 - 2. Door, Glazed Light, and Pocket Door Frames: White Oak; prepare for paint finish.

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 - BASIC PRODUCT REQUIREMENTS.
- 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 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.

2.06 ACCESSORIES

- A. Lumber for Shimming and Blocking: Softwood lumber of Cedar or Pine species.
- B. Aluminum Edge Trim: Extruded flat shape; smooth surface finish; self locking serrated tongue; of width to match component thickness; clear anodized finish.

- C. Primer: As specified in Section 099123.
- D. Wood Filler: Solvent base, tinted to match surface finish color.

2.07 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>.

2.08 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.

2.09 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.

2.10 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/AWMA/WI (AWS) or AWMA/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:

- a. System - 1, Lacquer, Nitrocellulose.
- b. Stain: As selected by Architect/Engineer.
- 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 - ROUGH CARPENTRY 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. 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 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 1/2" Reinforced LW concrete	2 Hour	2 Hour	NA	1 CFM/ Lin Ft.	

END OF SECTION 078413

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. Joints in or between fire-resistance-rated constructions.
 - 2. Joints in smoke barriers.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
 - 1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.04 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.05 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 UL's "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
 - 1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
 - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
 - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:

- c. UL - "Fire Resistance Directory."

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.07 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.01 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are 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 assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E1966 or UL 2079:
 - 1. Joints include those installed in or between fire-resistance-rated walls floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
 - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
 - 3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hilti, Inc.
 - b. 3M Fire Protection Products.
 - c. Cemco - Cemco Hotrod Type-X.
 - d. Or approved equal
- C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.
 - 1. L-Rating: Not exceeding 5.0 cfm/ft (0.00775 cu. m/s x m) of joint at 0.30 inch wg (74.7 Pa) at both ambient and elevated temperatures.
 - 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hilti, Inc.
 - b. 3M Fire Protection Products.
 - c. Or approved equal.

- D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system 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 fire-resistive joint system's seal with substrates.

3.03 INSTALLATION

- A. General: Install fire-resistive joint systems 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 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 fire-resistive joint system.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 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 fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.05 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.
- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.06 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.07 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.
- B. Floor-to-Floor, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: FF-S-Insert .
 - 2. Assembly Rating: 1 hour 2 hours.
 - 3. Nominal Joint Width: As indicated.
 - 4. Movement Capabilities: Class I - 15 percent compression, extension, or horizontal shear.
 - 5. L-Rating at Ambient: Less than Insert cfm/ft. (cu. m/s x m).
 - 6. W-Rating: No leakage of water at completion of water leakage testing.
- C. Wall-to-Wall, Fire-Resistive Joint Systems FRJS-Insert:
 - 1. UL-Classified Systems: WW-S-Insert.
 - 2. Assembly Rating: 1 hour 2 hours.

- D. Floor-to-Wall, Fire-Resistive Joint Systems FRJS-Insert:
 - 1. UL-Classified Systems: FW-S-insert .
 - 2. Movement Capabilities: Class I - 15 percent compression, extension, or horizontal shear.

- E. Head-of-Wall, Fire-Resistive Joint Systems FRJS-Insert:
 - 1. UL-Classified Systems: HW-S-Insert.

- F. Bottom-of-Wall, Fire-Resistive Joint Systems FRJS-insert:
 - 1. UL-Classified Systems: BW-S-insert .
 - 2. Assembly Rating: 1 hour 2 hours.

- G. Perimeter Fire-Resistive Joint Systems PFRJS-insert:
 - 1. UL-Classified Perimeter Fire-Containment Systems: CW-S-insert.

END OF SECTION 078446

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 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 hollow-metal doors, fixed panels and frames.

1.03 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.04 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Samples for Verification:
 - 1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
 - 2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction.
- D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.06 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door Products; an Assa Abloy Group company.
 - 2. Curries Company; an Assa Abloy Group company.
 - 3. Karpen Steel Custom Doors & Frames.
 - 4. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.02 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.03 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra Heavy-Duty Doors and Frames: SDI A250.8 - Level 3 At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level B according to ANSI/SDI A250.4.
 - 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gauge) (Level 3).
 - b. Construction: Face-welded Type.
 - 3. Exposed Finish: Prime and paint.

2.04 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.05 MATERIALS

- A. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- C. Frame Anchors: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M, hot-dip galvanized according to ASTM A153/A153M, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- E. Grout: ASTM C476, except with a maximum slump of 4 inches, as measured according to ASTM C143/C143M.
- F. Glazing: Comply with requirements in Section 088000 - GLAZING
- G. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.06 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 - 4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.

5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
 6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
 8. Terminated Stops: Terminate stops 6 inches above finish floor with a 45 degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in ANSI/SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Frame Moldings: Provide beveled stops and frame moldings around glazed lites and louvers where indicated. Form corners of interior stops and moldings with mitered hairline joints. Exterior frame moldings shall be welded and ground smooth prior to priming.
1. Single Glazed Lites: Provide beveled fixed stops and moldings welded on secure side of hollow-metal work.
 2. Multiple Glazed Lites: Provide beveled fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide beveled fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Frame profiles shall be beveled unless indicated otherwise on the drawings.
 5. Provide beveled loose stops and moldings on inside of hollow-metal work.
 6. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.07 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.08 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing anti-freezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

- D. Glazing: Comply with installation requirements in Section 088000 - GLAZING and with hollow-metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.04 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

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.

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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Eggers Industries
 2. Graham Wood Doors; an Assa Abloy Group company
 3. Marshfield - Algoma; a Masonite company
- 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: Extra Heavy Duty as specified.
- D. WDMA I.S. 1A Performance Grade:
1. Extra Heavy Duty unless otherwise indicated.
- 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 core specified or mineral core as needed to provide fire-protection 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.
- 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: White Oak.
 3. Cut: Rotary cut.
 4. Match between Veneer Leaves: Book match.
 5. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
 6. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
 7. Core: Either glued wood stave or structural composite lumber.
 8. 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.
 9. WDMA I.S. 1A1-A Performance Grade: Extra Heavy Duty.

2.04 LIGHT FRAMES AND LOUVERS

- A. Metal Vision Light Frames for Fire Rated Doors: 18 gauge cold rolled steel, Custom Color Baked Enamel finish, Type M4 as per WDMA I.S. 1A as manufactured by one of the following:
 - 1. Anemostat Door Products; LoPro Metal Vision Frames for 1/4" or 5/16" glazing and Specialty Metal Vision Frames with Mullions as detailed.
 - 2. or approved equal.

2.05 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. 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 - GLAZING.
 - 3. Louvers: Factory install louvers in prepared openings.

2.06 FACTORY FINISHING

- 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 stained to match existing.
- C. 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) and TR-4/OP-4 (Heavy-Duty) catalyzed polyurethane.
 - 4. Staining: As selected by Architect from manufacturer's full range.
 - 5. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores or as selected by the architect.
 - 6. 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: For installation, see Section 087100 - DOOR HARDWARE.
- 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, provide 1/4 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 SECTION INCLUDES

- A. Stile and Rail Wood doors and transom panels; glazed and non-glazed configuration; fire-rated and non-rated.

1.02 RELATED SECTIONS

- A. Section 087100 - DOOR HARDWARE.

1.03 REFERENCES

- A. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2019.
- B. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.
- C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.
- D. ASTM E152 - Methods of Fire Tests of Door Assemblies.
- E. AWI - Quality Standards of the Architectural Woodwork Institute.
- F. WDMA - National Wood Window and Door Association
- G. Intertek Testing Services - Warnock Hersey - Fire Tests of Door Assemblies.

1.04 DOOR AND PANEL DESCRIPTION

- A. Interior Doors (Non-rated): 1-3/4 inches thick; stile and rail construction.
- B. Interior Doors (Fire-Rated): 1-3/4 inches thick; stile and rail construction, ninety (90) minute rated
- C. Paneling: Species to be same as door

1.05 SUBMITTALS

- A. Submit under provisions of Section 013300 - SUBMITTALS.
- B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, identify cutouts for glazing and louvers.
- C. Product Data: Indicate door core materials and construction; veneer species, type and characteristics; factory machining criteria, factory finishing criteria and hardware preparations and labeling requirements.
- D. Samples: Submit one sample of door construction, 10 x 10 inch in size cut from top or bottom corner of door.
- E. Samples: Submit set of three samples of door veneer, 8 x 10 inch in size illustrating wood , stain and sheen color variation.]

1.06 REGULATORY REQUIREMENTS

- A. Fire Door Construction: Conform to ASTM E152, NFPA 252, Warnock Hersey International.
 - 1. Doors constructed to meet UL-10-C.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING and manufacturer's instructions.
- B. Accept doors on site in manufacturer's standard packaging. Inspect for damage upon receipt.
- C. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week.
- D. Break seal on packages while at site to permit ventilation.
- E. If any door is to be field finished, the total surface of the door must be fully block sanded in a horizontal position with 150 to 180 grit sandpaper to remove all grain raise, handling marks, damage or other residual attributes and to soften compressed wood grain, leaving uniformly prepared surfaces before any stain is applied.

1.08 COORDINATION

- A. A. Coordinate work under provisions of Section 013100 - PROJECT MANAGEMENT AND COORDINATION.
- B. Coordinate the work with door opening construction, door frame and door hardware installation.

1.09 WARRANTY

- A. Provide manufacturer's warranty under provisions of Section 017800 - CLOSEOUT SUBMITTALS to the following term:
 - 1. Interior Stile and Rail Doors: Lifetime
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction,.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Marshfield Door Systems
- B. Other acceptable manufacturers:
 - 1. Maiman Door
 - 2. Eggers
 - 3. Or approved equal.

2.02 DOOR CONSTRUCTION

- A. Face Veneer: WDMA A grade. Veneer species: Oak or as required to match existing species. Veneer cut: Plain Sliced and Rift Cut to match existing veneers.
 - 1. Veneer orientation on top, cross and bottom rails shall run between the vertical stiles, and mullions shall run between horizontal rails. Components shall be selected for compatibility of color, member-to-member. Veneer match between adjacent flitch leaves within a single panel shall be random running slip. Veneer sequence between adjacent panels shall be selected for compatibility of grain and color. Veneered panel sequence between paired doors shall be selected for compatibility in general appearance.

2.03 MATERIALS

- A. Stiles, Rails, Mullions and Cross rails: Shall be solid core construction using wood species to match existing doors. Joints to be tongue and grooved, doweled, and glued under pressure with Type I, waterproof glue.
- B. Panels: Solid core with perimeter shaped to proper contour, with panels to match existing doors. Panel edge concealed after assembly by solid lumber sticking bead. Panels edges shall be machined to produce have raised panel profile to match existing doors
- C. Sticking: Beveled profile to match existing door sticking, coped at corners, same species as face veneer. Overall Thickness: 1 3/4 inch
 - 1. Top Rail: 5 inches or as detailed.
 - 2. Lock Rail: 7-1/2 inches or as detailed.
 - 3. Stiles: 5 inches or as detailed.
 - 4. Bottom Rail: 8 1/2 inches.
 - 5. Cross rails & Mullions 3 5/8 or as detailed.
 - 6. Muntin Bars: 1/2 inch or as detailed
- D. The outer most vertical edges of the lock or hinge stiles, on single doors: lumber of same specie as face veneer.
- E. Meeting vertical edge (lock edge) of stiles on fire rated pair doors: Fire treated Maple lumber, veneer banded to match face veneers.

2.04 ADHESIVES

- A. Facing Adhesive: Type I - waterproof.

2.05 ACCESSORIES AND FIRE-RATED GLAZING AND ACCESSORIES

- A. Glazing Stops: Wood, of same specie as face veneer, shall match sticking profile, and have mitered corners. Glazing stops retaining factory glass and glazing to be affixed with counter sunk nails.
- B. Fire-rated Door, Transom and Sidelight Glazing: Firelite PLUS, 5/16" thick fire-rated as manufactured by Technical Glass Products or approved equal.

2.06 GLAZING FRAMES

- A. Factory Glazing Installation: Factory install glass in fire rated doors. Fill wood glazing bead nail holes in factory finished doors. Cover metal fire-rated glazing frame fastening locations with wood veneer as specified herein.
 - 1. Wood Species: Same species as door faces.
 - 2. Profile: Lipped tapered beads, profile per Marshfield W-2 or as required to match existing profiles .
 - 3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips as required and approved for such use.

2.07 FABRICATION

- A. Fabricate ninety (90) minute fire-rated and non-rated doors in accordance with specified manufacturers' and Intertek Testing Services - Warnock Hersey requirements. Attach fire rating label to the door.

- B. Door Company shall have the ability to provide fire-rated meeting stiles on double doors in lieu of overlapping metal edge and astragals as noted below:.
- C. Astragals for fire-rated double doors can only be fabricated of steel materials and be of specific configurations; refer to referenced fire test assembly for material and type. Astragals are usually provided by a door manufacturer and are not usually provided under the door hardware listings. Marshfield Door Systems has the approval to use fire treated meeting stiles on paired doors in lieu of an overlapping metal edge and astragal. However; all manufacturers do not. Certain vertical rod panic devices may require special astragal shapes, installation and may violate label ratings.
- D. Astragals for 90 Minute Fire-Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge at mid-door thickness, specifically for double doors.
 - 1. Provide ninety (90) minute paired openings with doors not requiring an overlapping metal edge or astragal; Veneer band meeting stile edges to match face species.
 - 2. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- E. Factory pre-fit doors for frame opening dimensions identified on shop drawings.

2.08 FINISH

- A. Factory finish doors in accordance with WDMA in accordance with WDMA IS 6A-11:
 - 1. Finish Doors: System TR-6, custom grade quality, as selected by the Architect.
 - 2. Factory finish doors stained to match existing in accordance with approved sample.

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. Any deficiencies must be corrected prior to door installation.
 - a. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Hardware: For installation, see Sections 087100 "Door Hardware" and Section 061000 - "Rough Carpentry"
 - 1. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- B. Install fire-rated doors according to NFPA 80.
- C. Install smoke- and draft-control doors according to NFPA 105.
- D. 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 (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering

unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

- a. Comply with NFPA 80 for fire-rated doors.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 3. Trim bottom rail only to extent permitted by labeling agency.
- E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
1. Factory-Finished Doors: Do not trim factory finished doors for width.

3.03 ADJUSTING

- A. Operation: Correct any deficiency that prohibits the door from swinging or operating freely. Do not remove hinge screws after initial insertion. Shims used for alignment purposes must be inserted between hinge and frame. Do not insert shims between hinge and door.
- B. To prevent stile failure, insure that door closers are properly adjusted and do not limit the door opening swing. Limit door opening swing only with a properly located stop.
1. 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 081433

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; 2017.
- E. NFPA 288 - Standard Methods of Fire Tests of Floor Fire Door Assemblies Installed Horizontally in Fire Resistance-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.
 - 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

SECTION 087100 – FINISH HARDWARE

- 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.

SECTION 087100 – FINISH HARDWARE

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.

SECTION 087100 – FINISH HARDWARE

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,

SECTION 087100 – FINISH HARDWARE

- 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.

SECTION 087100 – FINISH HARDWARE

- 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.

SECTION 087100 – FINISH HARDWARE

- 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

SECTION 087100 – FINISH HARDWARE

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

SECTION 087100 – FINISH HARDWARE

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.

SECTION 087100 – FINISH HARDWARE

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.

SECTION 087100 – FINISH HARDWARE

- 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

SECTION 087100 – FINISH HARDWARE

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

SECTION 087100 – FINISH HARDWARE

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 PanicExit 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.

SECTION 087100 – FINISH HARDWARE

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.

SECTION 087100 – FINISH HARDWARE

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

SECTION 087100 – FINISH HARDWARE

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 keyclips, 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.

SECTION 087100 – FINISH HARDWARE

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: Powdercoating 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.

SECTION 087100 – FINISH HARDWARE

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.

SECTION 087100 – FINISH HARDWARE

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 highrise 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:

SECTION 087100 – FINISH HARDWARE

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.

SECTION 087100 – FINISH HARDWARE

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.

SECTION 087100 – FINISH HARDWARE

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:

SECTION 087100 – FINISH HARDWARE

**Hardware Group No. 01 - ND73 PUSH BUTTON LOCK FOR LOCK DOWN FROM INTERIOR SIDE - IN-SWING DOORS WITH OH STOP
NEW DOOR X NEW FRAMES**

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONTINUOUS HINGE	112HD	606	IVE
1	EA	CORRIDOR LOCK	ND73TD ATH	606	SCH
1	EA	FSIC CORE	23-030 EV29 T	606	SCH
1	EA	OH STOP	90S	606	GLY
1	EA	SURFACE CLOSER	4011	696	LCN
			(CLOSER MOUNTED PULL SIDE)		
1	EA	MOUNTING PLATE	4010-18	696	LCN
1	EA	MOP PLATE	8400 8" X 1" LDW	606	IVE
1	EA	KICK PLATE	8400 8" X 2" LDW	606	IVE
1	SET	SEALS	188S	BLK	ZER

NOTE:

1. NEW DOORS X NEW FRAMES
2. THE 4010-18 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.

Hardware Group No. 2 - NEW DOORS X NEW FRAMES

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONTINUOUS HINGE	112HD	633	IVE
2	EA	FIRE EXIT HARDWARE	9827-L-BE-F-LBR-996-17-499F-SNB	606	VON
2	EA	SURFACE CLOSER	4011T MC	US4	LCN
2	EA	WALL STOP	WS407CCV	606	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7830	689	LCN
			X SEM8710-E514 COUPLER ASSEMBLY X SEM7810-EXXX INDICATE SIZE OF EXTENSION)		
1	SET	SEALS	188S	BLK	ZER
1	SET	ASTRAGAL	314AN	AN	PEM
1	EA	POWER SUPPLY	PS902 900-BAT 900-2RS FA900 KL900	LGR	SCE

NOTE:

1. THE FIRE BOLT INCLUDED WITH THE EXIT DEVICES MUST BE INSTALLED ON PAIRS OF RATED DOORS ORDERED LESS BOTTOM ROD (LBR)
2. ELECTRO-MAGNETIC HOLD OPEN DEVICE REQUIRES FIRE ALARM INTERFACE. IN A FIRE ALARM, HOLD OPEN DEVICE TO RELEASE, ALLOWING DOORS TO CLOSE.
3. PROVIDE SEM7810-E514 COUPLER ASSEMBLY X EXTENSION SEM7810-EXXX (XXX INDICATES SIZE OF EXTENSION, AVAIL 1/2" THRU 4", CAN BE LINKED TOGETHER FOR LONGER EXTENSIONS), WHERE REQUIRED IN ORDER FOR ARMATURE MOUNTED ON THE DOOR TO REACH THE MAGNETIC HOLDER.
4. COORDINATE WITH SECURITY DRAWING/SPECIFICATIONS

SECTION 087100 – FINISH HARDWARE

**Hardware Group No. 3 - NEW DOOR x NEW FRAME
ND73 CLASSROOM**

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONTINUOUS HINGE	112HD	633	IVE
1	EA	CORRIDOR LOCK	ND73TD SPA	606	SCH
1	EA	FSIC CORE	23-030 EV29 T	606	SCH
1	EA	SURFACE CLOSER	4111 CUSH	696	LCN
1	EA	MOP PLATE	8400 8" X 1" LDW	606	IVE
1	EA	KICK PLATE	8400 8" X 2" LDW	606	IVE
1	EA	WALL STOP	WS407CCV	606	IVE
1	SET	SEALS	188S	BLK	ZER

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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Glazed curtain walls.
 - 2. Storefront framing.
 - 3. Glazed entrances.
 - 4. Interior borrowed lites.
 - 5. Skylight Glazing.
 - 6. Door and Window glazing.

1.03 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.
- C. Interspace: Space between lites of an insulating-glass unit.
- D. Sealed Insulating Glass Unit Surface Designations:
 - 1. Surface #1 - Exterior surface of the outer glass lite
 - 2. Surface #2 - Interspace surface of the outer glass lite
 - 3. Surface #3 - Interspace surface of the inner glass lite
 - 4. Surface #4 - Interior surface of the inner glass lite or the interlayer surface of the first layer of laminated glass.
 - 5. Surface #5 - Interlayer surface of the second layer of laminated glass.
 - 6. Surface #6 - Interior surface of the second layer of laminated glass.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
 - b. Basic Wind Speed: 130 mph.
 - c. Importance Factor: III.
 - 2. Design Snow Loads: As indicated on Drawings.
 - 3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 - 4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.05 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.
 - 1. Tinted glass.
 - 2. Fire-resistive glazing products.
- C. Glazing Accessory Samples: For gaskets sealants and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers manufacturers of insulating-glass units with sputter-coated, low-e coatings glass testing agency and sealant testing agency.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass coated glass insulating glass glazing sealants and glazing gaskets.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Warranties: Sample of special warranties.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

- E. Source Limitations for Glass: Obtain tinted float glass coated float glass laminated glass and insulating glass from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.
- J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install glazing in mockups specified in Section 084113 - Aluminum-Framed Entrances and Storefronts. and Section 084413 - Glazed Aluminum Curtain Walls, as applicable, to match glazing systems required for Project, including glazing methods.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within

specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.02 GLASS PRODUCTS

- A. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - 2. For uncoated glass, comply with requirements for Condition A.
 - 3. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.03 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Lamine glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.
- B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.04 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies.
- B. Laminated Fire-Rated (20 to 180 minutes), High Impact Safety-Rated Ceramic Glass, Ultra-HD technology, 5/16 inch thickness meeting CPSC 16CFR1201 (Cat. I and II) and ANSI Z97.1, withstands thermal shock. 5-year limited warranty. Surface Grade - Standard.
 - 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. TGP Firelite Plus
 - b. or approved equal

2.05 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 - 1. Neoprene complying with ASTM C864.
 - 2. EPDM complying with ASTM C864.
 - 3. Silicone complying with ASTM C1115.
 - 4. Thermoplastic polyolefin rubber complying with ASTM C1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene EPDM gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
 - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.06 GLAZING SEALANTS

- A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700
 - c. Pecora Corporation; 890
 - d. Sika Corporation, Construction Products Division; SikaSil-C990
 - e. Tremco Incorporated; Spectrem 1
- C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.07 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.08 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.09 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.10 MONOLITHIC-GLASS TYPES

- A. Glass Type MG- Clear fully tempered float glass.
 - 1. Thickness: 1/4 inch (6.0 mm).
 - 2. Provide safety glazing labeling.
- B. Glass Type MG-: Polished wired glass.
 - 1. Thickness: 8.0 mm.
 - 2. Square (Baroque) wire pattern with applied 7 mil safety film.
 - 3. Weight: 3.0 lbs. / sq. ft.
 - 4. STC Rating: STC 28
 - 5. Manufacturer: SaftiFirst "SuperI-W " or approved equal.
 - 6. CSPC 16 CFR 1201 Cat. I and II.
- C. Glass Type MG-:
 - 1. Thickness: 0.500 inch.
 - 2. Mar/UV resistant Lexan MR10 Polycarbonate Glazing with Margard II Coating.
 - 3. Manufacturer: SABIC GLOBAL TECHNOLOGIES.
 - 4. 10-year warranty.
 - 5. Dade County approved.
 - 6. Temperature Range: -40 degrees F to 180 degrees F.

2.11 INTERIOR LAMINATED-GLASS TYPES

- A. Glass Type LG1: Clear laminated glass with two plies of fully tempered float glass with etched surface pattern..

1. Thickness of Each Glass Ply: 1/8 inch (3.0 mm).
2. Interlayer Thickness: 0.090 inch (2.29 mm).
3. Provide safety glazing labeling.
4. Provide acid-etched banding as indicated on the drawings.

- B. Glass Type LG-: Fire-rated laminated glass
1. Thickness: 8.0 mm.
 2. Provide safety glazing label- CSPC 16 CFR 1201 Cat. I and II.
 3. Manufacturer: TGP Firelite Plus or approved equal.

2.12 EXTERIOR INSULATING GLASS TYPES

- A. Glass Type IG-1: Low-E coated, insulating glass.
1. Overall Unit Thickness: 1 inch.
 2. Exterior Glass Lite: 1/4 inch tempered Solarban 60 Low-E (2) StarPhire glass.
 3. Interspace Content: Argon - 1/2 inch.
 4. Indoor Glass Lite: 1/4 inch tempered StarPhire glass.
 5. Visible Light Transmittance: 71 percent minimum.
 6. Winter Nighttime U-Factor: 0.24 maximum.
 7. Solar Heat Gain Coefficient: 0.38 maximum.
- B. Glass Type IGL-2: Low-E coated, insulating glass.
1. Overall Unit Thickness: 1 inch.
 2. Exterior Glass Lite: 1/4 inch tempered Solarban 60 Low-E (2) Optigray glass.
 3. Interspace Content: Argon - 1/2 inch.
 4. Indoor Glass Lite: 1/4 inch tempered StarPhire glass
 5. Visible Light Transmittance: 50 percent minimum.
 6. Winter Nighttime U-Factor: 0.24 maximum.
 7. Solar Heat Gain Coefficient: .23 maximum.
- C. Glass Type IG-3: Spandrel Glass - ICD OPACI-COAT-300 Silicone Opacifier coating, Low-E, insulating spandrel glass.
1. Overall Unit Thickness: 1 inch.
 2. Thickness of Exterior Glass Lite: 1/4 inch fully tempered Solarban 60 (2) SolarGray glass.
 3. Interspace Content: Argon - 1/2 inch.
 4. Indoor Lite: 1/4 inch fully tempered Clear with ICD OPACI-COAT-300 Silicone Opacifier coating (4).
 5. Opacifier Color: ICD 3-4094 - Graylights or as selected by the Architect to match glazing system.
 6. Winter Nighttime U-Factor: 0.24 maximum.

2.13 EXTERIOR LAMINATED INSULATING GLASS TYPES

- A. Glass Type ILG-1: Low-e-coated, insulating glass.
1. Overall Unit Thickness: 1.34 (with 0.090 PVB interlayer - 1/4" glass).
 2. Exterior Glass Lite: 1/4 inch fully tempered float glass, Solarban 60 Low-E(2) SolarGray.
 3. Interspace Content: Argon - 1/2 inch..
 4. Indoor Glass Lite: 1/4 inch heat strengthened Clear - 0.090 inch Clear PVB - 1/4 inch heat strengthened Clear.
 5. Visible Light Transmittance: 35 percent minimum.
 6. Winter Nighttime U-Factor: 0.24 maximum.
 7. Solar Heat Gain Coefficient: 0.25 maximum.
 8. Provide safety glazing labeling.
- B. Glass Type ILGL-2: Low-e coated, insulating glass.

1. Overall Unit Thickness: 1.31 (with 0.060 PVB interlayer).
 2. Exterior Glass Lite: 1/8 inch Clear - 0.060 inch clear PVB -1/8 inch Solarban 60 Low E (4) on Clear.
 3. Outdoor Lite: Tinted fully tempered float glass.
 4. Interspace Content: Argon - 1/2 inch.
 5. Indoor Glass Lite: 1/4 fully tempered float Clear glass.
 6. Visible Light Transmittance: 45 percent minimum.
 7. Winter Nighttime U-Factor: 0.24 maximum.
 8. Solar Heat Gain Coefficient: 0.38 maximum.
- C. Glass Type ILG-3: Spandrel Glass; Low-E, insulating spandrel glass.
1. Overall Unit Thickness: 1.31 (with 0.060 PVB interlayer).
 2. Exterior Glass Lite: 1/4 inch fully tempered float glass, Solarban 60 Low-E(2) SolarGray.
 3. Interspace Content: Argon - 1/2 inch.
 4. Indoor Lite: 1/4 inch heat strengthened Clear with 0.060 clear PVB on 1/4 inch heat strengthened with Ceramic-Coated Spandrel Glass
 5. Ceramic Frit Color: Warm Gray
 6. Winter Nighttime U-Factor: 0.29 maximum.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep systems.
 3. Minimum required face and edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.03 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.07 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove non-permanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Work of this Section consists of providing all labor, materials and equipment and services to complete the following plaster restoration on the interior of the Jones Beach West Bathhouse:
 - 1. Repair of flat plaster matching the adjacent configuration including base coats including, but not limited to:
 - a. All areas or wall and ceiling surfaces affected by the restoration of adjacent materials.
 - 2. Repair of ornamented plaster:
 - a. All moldings, medallions, ceiling or wall surfaces or other areas as shown on Drawings.

1.02 RELATED SECTIONS

- A. Section 040120 - TOILET COMPARTMENTS-PHENOLIC
- B. Section 060140 - INTERIOR WOOD RESTORATION
- C. Section 099123 - INTERIOR PAINTING

1.03 REFERENCES

- A. ASTM C206 - Standard Specification for Finishing Hydrated Lime; 2014.
- B. ASTM C28/C28M - Standard Specification for Gypsum Plasters; 2010 (Reapproved 2015).
- C. ASTM C35 - Standard Specification for Inorganic Aggregates for Use in Gypsum Plaster; 2001 (Reapproved 2019).
- D. ASTM C631 - Standard Specification for Bonding Compounds for Interior Gypsum Plastering; 2009 (Reapproved 2020).
- E. Materials and methods shall conform to the "Secretary of the Interior's Standards for the Rehabilitation and Guidelines for Rehabilitating Historic Buildings," 1995.
- F. "Repairing Historic Flat Plaster-Walls and Ceilings," Preservation Brief #21, Preservation Assistance Division, NPS, 1989.
- G. "Preserving Historic Ornamental Plaster," Preservation Brief #23, Preservation Assistance Division, NPS, 1990.

1.04 JOB CONDITIONS

- A. Quantities and Locations: The General Contractor and Architect shall review all of the areas below to confirm quantities and locations of plaster repairs.
- B. Curing Temperature: Provide adequate air circulation during curing and maintain a temperature of 55-70 degrees Fahrenheit.

1.05 QUALITY ASSURANCE

- A. Work shall be performed by a Contractor specializing in the fabrication and repair of historic plaster. The Contractor must have a minimum of five (5) years of experience. Contractor must demonstrate three projects similar in scope and type to the required work in the New York / New

Jersey region involving facilities designated as Landmarks by local government, or building listed on the National or State Register of Historic Places.

- B. Qualification of Personnel: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and workers who are familiar with the specified requirements of restoration of historic plaster restoration and the methods needed for proper performance of the work of this Section.
- C. Mechanics shall be highly skilled in the art and craft of plastering, both flat and ornamental, with the work of this section to the highest standard for such work. No allowances will be made for the lack of skill of mechanics.
- D. Contractor shall replace at no additional expense to the Owner all broken, lost or damaged materials during the masonry restoration.
- E. Work is to be performed on a daily basis without interruption unless directed otherwise by the Architect.
- F. Obtain materials for plaster restoration from a single source for each type of material required to ensure match in quality, color, and texture.
- G. Materials shall be used only at the manufacturer's recommended temperature tolerances.
- H. Coordination: Contractor shall coordinate work of all other trades related to the successful completion of this work.
- I. Ornamental plasterwork:
 - 1. If replacements for ornamental elements or decorative plaster forms are necessary to complete the work of this section these may be cast in molds off-site, and then assembled and installed in the building.
 - 2. If repairs are to be made to ornamental elements, repairs are to be seamless.

1.06 SUBMITTALS

- A. Submit qualification data and references for firms and persons specified in Section "Quality Assurance" to demonstrate their capabilities and experience.
- B. Contractor shall submit a work plan including detailed description of how the work of this Section shall be accomplished. This should include products to be used, methods and equipment, etc.
- C. Provide written descriptions, drawings and diagrams outlining proposed methods and procedures for protection of personnel, the public and the existing construction during the work of this Section.
- D. Materials list: Provide list of all proposed materials.
- E. Product Literature: The Contractor shall submit copies of the manufacturer's technical data for each product including their recommendations for installation and use. Include test results and certificates that verify the product's compliance with the specification's requirements. One complete set of product literature and MSDS shall be placed in a 3-ring loose-leaf binder and shall be present on the job site at all times for the reference of the Architect.
- F. If alternate methods and materials to those specified are proposed for any phase of the restoration work, provide written description. Provide evidence of successful use on comparable projects and demonstrate its effectiveness for use on this project.

1.07 MOCK-UPS

- A. Prior to executing work, provide in-place mock-ups for the Architect's approval. Resubmit panels until the Architect is fully satisfied. Mock-ups shall be prepared by the Contractor using the same workmen, methods and materials that will be employed for the remainder of the work. Upon approval, the mock-ups will remain the standards of work throughout the job. The approved mock-ups shall be retained, undisturbed and suitably marked, throughout construction. Mock-ups may be incorporated into the finished work when approved by the Architect.
- B. At an area of the site where approved by the Architect, Contractor shall provide sample plaster panels:
 - 1. One (1) flat plaster repair
 - 2. One (1) of each type of ornamental plaster repair.
- C. These sample panels shall be large enough to demonstrate range of treatments needed for flat surfaces and ornamental areas.
- D. Mock-ups may be part of the Work, and may be incorporated into the finished work when so approved by the Architect.
- E. Revise sample panels as necessary to secure this approval.
- F. Mock-ups will serve as a standard for the acceptance or rejection for the work of this contract.

1.08 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered to the job site in factory-sealed containers clearly labeled as to the product, manufacturer, color and other pertinent characteristics.
- B. All materials for use in the work of this Section shall be stored under environmental conditions recommended by the manufacturer. Materials shall be kept dry (includes liquid moisture and water vapor), well-ventilated, and free of organic matter.
- C. Arrangement shall be made with the Owner to store equipment and materials in designate areas. The Owner shall not be responsible for damaged or stolen materials or equipment left on the premises by the Contractor.

1.09 COORDINATION

- A. At least three weeks prior to commencing the work of this Section, a meeting must be scheduled at the jobsite to discuss conformance with the requirements of specifications and job site conditions. Representatives of the Contractor, Architect and other parties involved in the scope of this work shall attend the meeting.
- B. The Contractor shall coordinate his or her work with that of all other trades related to the successful completion of the work of this section.

PART 2 - PRODUCTS

2.01 PLASTER

- A. U.S. Gypsum, National Gypsum Company, or approved equal. Gypsum plaster shall comply with ASTM C28/C28M.

- B. Sand for Gypsum Plaster: shall comply with ASTM C35.
- C. Hydrated Lime: pressure hydrated, shall comply with ASTM C206.
- D. Molding Plaster: white, shall comply with ASTM C28/C28M.
- E. Patching Plaster: white, shall comply with ASTM C28/C28M.
- F. Bonding Agent: shall comply with ASTM C631.

2.02 PLASTER MIXES

- A. General Conditions:
 - 1. Proportion and measure the materials for each batch of plaster accurately.
 - 2. Prepare batches in quantity for complete use within a maximum of one hour after mixing, and to set up within a maximum of four hours.
 - 3. Do not retemper or use partially set plaster.
 - 4. Do not use frozen, caked, or lumpy material, but remove such material from the job site immediately.
 - 5. Withhold 10% of the required water until the mixing cycle is nearly completed, then add water as needed to achieve the required consistency.
- B. Gypsum scratch coat: One part fibered Gypsum, neat plaster, 2 parts sand by weight.
- C. Gypsum brown coat: One part gypsum plaster, 3 parts sand by weight.
- D. Gypsum finish: 1/16" to 1/8" neat (no lime) hard white coat (similar to U.S. Gypsum Diamond Finish) or approved equal.
- E. Patching plaster: Follow manufacturer's directions.

2.03 LATH

- A. Galvanized expandable diamond mesh metal lath and galvanized nails, type and size as determined by size of repair.

2.04 WATER

- A. Provide water which is potable and free from all substances that would be deleterious to gypsum plaster.

2.05 MODELS/MOLDS

- A. If molds or models are necessary to replicate ornamental plaster forms affected by the installations of this contract the Contractor shall secure mechanics qualified to produce them without causing damage to the existing historic elements.
- B. Molds should be fabricated of thixotropic rubber with plaster casts generated from them. If molds are made from existing elements that shall remain in place proper release agents should be used and all care should be taken not to damage remaining elements.
- C. Flood or gang molds may be employed using urethane rubber and barrier or separator agents.

2.06 RETARDING AGENTS

- A. The use of retarding agents in plaster mixes will not be permitted.

2.07 BONDING AGENTS

- A. If bonding agent is used it shall be a material producing a permanent bond and not affected by freezing, heat, acids, alkalis, dampness and producing no discoloration to finished plaster surfaces.

PART 3 - EXECUTION

3.01 TEMPORARY PROTECTION

- A. Cover adjacent surfaces and adjacent decorative features with protective sheeting to contain plaster fragments and dust during removal and preparation, and to contain plaster droppings during the application of respective base, brown and finish coats.

3.02 INSPECTION

- A. The Contractor shall examine substrate and conditions under which this work is to be performed and notify the Architect in writing of conditions detrimental to the proper completion of the work. Do not proceed until unsatisfactory conditions are corrected. Commencement of work indicates that Contractor accepts substrate and conditions.
- B. Correct any conditions that are detrimental to the successful completion of the work. Sequencing of work should be scheduled to ensure that completed work will match existing.

3.03 PREPARATION OF ADJOINING SURFACES

- A. Carefully remove loose plaster, loose or deteriorated lath, and other materials necessary to achieve a sound substrate and adjacent keying surfaces.

3.04 SUBSTRATE PREPARATION

- A. Preparing void: All affected areas of plasterwork shall be removed. Depth of removal will vary between locations due to degree of repair necessary.
- B. Damaged Lath: All damaged or deteriorated lath shall be removed and replaced with galvanized metal diamond lath.
- C. Missing Lath: If no lath is present and will be required for proper plaster attachment and keying, attach galvanized metal diamond mesh lath using galvanized nails. Lath should be mounted through existing plaster or onto existing lath to hold it securely in place.
- D. Securing Lath:
- E. Space fasteners not more than 6" apart.
- F. Attach lath to supports with fasteners appropriate to rigidly secure lath.
- G. Do not continue lath across expansion or control joints.
- H. Lap diamond mesh lath in a minimum of 1/8" at sides and 1" at ends.

3.05 APPLICATION

- A. General:
1. Schedule application of plaster to precede application of other finishes which could be damaged by operations incidental to plastering.
 2. Apply the appropriate thickness for each specific application according to the National Plasterer's Association guidelines.
 3. Each new plaster layer should be lapped or stepped over old plaster layers so that old and new are evenly joined.
- B. Two-coat Application (Base Coat and Finish Coat):
1. Apply the base coat with sufficient material and force to cover the substrate and to form a good bond.
 2. Double back with the same plaster mix.
 3. Bring base coat out to grounds prior to plaster set up.
 4. Smooth off plaster to form a true and level surface.
 5. Lightly cross rake or hatch, leaving texture adequate to promote a solid bond with the finish coat.
- C. Three-coat Application (Base Coat, Brown Coat and Finish Coat):
1. Apply the base coat with sufficient material and force to cover the substrate and to form a good bond, or key, as appropriate.
 2. Cross rake or hatch to provide a surface sufficiently rough to receive second coat (brown coat), and allow to dry.
 3. Set screeds prior to application of the brown coat.
 4. Apply the brown coat, bring the surface up to the ground, and flatten to a true surface using a straight edge or two handled float, but without applying water.
 5. Lightly cross rake or hatch, leaving sufficient texture to promote sound bond with the finish coat.
- D. Finish-coat Application:
1. General:
 - a. Apply finish coat to base plaster coats which have set up and are partially dry.
 - b. Where base coats are more than partially dry, dampen the base coats by misting with water.
 2. Trowel finish:
 - a. Apply the finish coat with sufficient material and force to secure a sound bond.
 - b. Fill out to a true, flat and even surface.
 - c. When the finish coat has begun to set, trowel with clean water to a smooth finish which is free from surface defects and irregularities.
 - d. Finish flat plaster true and even within a tolerance of 1 in 500, maximum variation from true flatness, leaving the finished surface without tool marks and other blemishes.
- E. Ornamental Plaster Applications:
1. New elements should be securely attached to the substrate, with any fastener heads patched so as to make them invisible.

3.06 CLEAN UP

- A. Upon completion of all other work of this Section, inspect all plaster surfaces and correct conditions which do not meet specified requirements.
- B. Remove protective materials and plaster materials from adjacent surfaces.

- C. Clean all areas of plaster droppings and splatter restoring affected areas to clean and neat conditions.

END OF SECTION 090120

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 - THERMAL INSULATION, 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. Cementitious Tile Backer Board.
 6. Water-Resistant Gypsum Tile backing panels.
 7. Trim and Accessories.
 8. Joint treatment, tapes, compounds and finishing.
 9. Miscellaneous metal framing, furring, and fasteners.
 10. Sound attenuation insulation and acoustical sealants.
 11. 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 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: 5/8 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.

2.05 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..

2.06 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.

2.07 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. 2³/₄", 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.

2.08 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 face 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. Ceramic and Porcelain tile.
 2. Stone thresholds.
 3. Waterproof membrane.
 4. Uncoupling Membranes.
 5. Tile backing panels.
 6. Metal edge strips.

1.03 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.04 PERFORMANCE REQUIREMENTS

- A. Dynamic Coefficient of Friction (DCOF AcuTest): For tile installed on walkway surfaces, provide products with the following values as determined by testing in accordance with ANSI standard ANSI A137.1, Section 9.6:
 1. Level Surfaces: Minimum 0.42.
 2. Step Treads: Minimum 0.42.
 3. Ramp Surfaces: 0.42.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- B. Samples for Initial Selection: For each type of tile and grout indicated, provide full range of colors and patterns available from the approved manufacturer. Include Samples of accessories involving color selection.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer certifying that products meet or exceed the specified requirements of ANSI A137.1.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.07 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.08 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum two years' experience.
- B. Single Source Responsibility: Obtain each type and color of tile from a single source. Obtain each type and color of mortar, adhesive and grout from the same source.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.01 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.
- D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.
- G. Grout Release: High-performance, sacrificial, water-based coating to protect tile from grout residue and haze. Rinses with water during clean-up. Apply two coats and allow to cure for one-hour minimum prior to grouting. Installation and removal shall be as recommended by the manufacturer.
 1. Manufacturer: Mapei "UltraCare" Grout Release or approved equal.

2.02 TILE PRODUCTS

- A. Tile Type: Porcelain glazed floor tile.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Daltile; Division of Dal-Tile International Inc.: PORTFOLIO CONFETTI
 - b. American Olean; Division of Dal-Tile International Inc.
 - c. Or approved equal.
 2. Face Size: 12 inch x 24 inch
 3. Thickness: 5/16 inch.
 4. Wearing Surface: Nonabrasive, smooth.
 5. Finish: Matte.
 6. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
 7. Grout Color: As selected by Architect from manufacturer's full range.
 8. Grout width: 3/16"
 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as selected from manufacturer's standard shapes.
- B. Tile Type: 1X1 Mosaic Porcelain wall tile:
 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Daltile; Division of Dal-Tile International Inc: Keystones.
 - b. American Olean; Division of Dal-Tile International Inc.
 2. Module Size: 12 inch x 24 inch or as indicated on the drawings.
 3. Thickness: 1/4 inch.
 4. Face: Plain with modified square edges or cushion edges.
 5. Finish: Vellum, clear glaze.

6. Tile Color and Pattern: MACARON BLEND DK25 (Boys), OLIVE BLEND DK23 (Girls), As selected by Architect from manufacturer's full range.
 7. Grout Color: As selected by Architect from manufacturer's full range.
 8. Grout Joint width: Wall: 1/16 inch; Mosaic: 1/8 inch.
 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Bullnose Top Base Trim: 3 inch x 10 inch or as indicated.
 - b. Wall Bullnose Corner: 3 inch x 3 inch
- C. Tile Type: Glazed Ceramic wall tile:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Daltile; Division of Dal-Tile International Inc: Color Wheel Collection - Classic.
 - b. American Olean; Division of Dal-Tile International Inc.
 - c. Or approved equal.
 2. Module Size: 6 inch x 6 inch pattern or as indicated on the drawings.
 3. Thickness: 5/16 inch.
 4. Face: Smooth
 5. Finish: Bright.
 6. Joint Width: 1/16 inch
 7. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
 8. Grout Color: As selected by Architect from manufacturer's full range.
 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. External Corners for Thin-Set Mortar Installations: 3 inch x 6 inch bullnose top and vertical edge trim and bullnose corner units.
 - b. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.
 - c. Cove Base Trim and Corner units.

2.03 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface. Comply with ICC A117.1 requirements.
 2. Size: 6 inches toe to toe unless noted otherwise. Cope thresholds to door frame profile.
- B. Granite Thresholds: ASTM C615/C615M, with honed finish.
 1. Description: Uniform, medium-grained, White Carrara stone without veining.
- C. Marble Thresholds: Uniform, fine- to medium-grained white stone with gray veining, ASTM C503/C503M with a minimum abrasion resistance of 10 per ASTM C1353/C1353M or ASTM C 241 and with honed finish. Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

2.04 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9>ANSI A108/A118/A136.1 or ASTM C1325, in maximum lengths available to minimize end-to-end butt joints. Provide 2 inch wide coated glass fiber tape for joints and corners.

1. Products: Subject to compliance with requirements, provide the following:
 - a. Custom Building Products; Wonderboard.
 - b. USG Corporation; DUROCK Cement Board.
2. Thickness: 5/8 inch or as indicated.

2.05 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Non-plasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch (0.76-mm) nominal thickness.
 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. Noble Company (The); Nobleseal TS.
 - b. Or approved equal.
- C. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
 - b. MAPEI Corporation; Mapelastic AquaDefense with MAPEI Fiberglass Mesh.
 - c. Or approved equal.
- D. MAPEI – Mapeguard WP200
 1. Description: Flexible polyethylene sheet membrane with polypropylene fabric on both sides with a low perm rating ideal for vapor protection in showers, wet areas, and steam rooms. Thickness is 0.02" (40 -50 mils nominally), blue in color.
 2. Waterproofing seaming membrane:
 - a. Provide MAPEI Mapeguard WPST Seam Tape and Mapeguard PIC & POC Corners material 0.004" (4 mil) thick, polyethylene membrane, with polypropylene fleece laminated on both sides.
 3. Waterproofing Accessories:
 - a. Provide MAPEI Mapeguard VC, (Valve seals).
 - b. Provide MAPEI Mapeguard PC, (Pipe seals).
- E. Schluter®-KERDI or approved equal.
 1. Description: 0.008" (8 mil) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides, which meets or exceeds the requirements of the "American National Standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10," and is listed by cUPC®, and is evaluated by ICC-ES (see Report No. ESR-2467 and PMG 1204).
 2. Waterproofing seaming membrane:
 - a. Provide Schluter®-KERDI-BAND Seams and Corners material 0.004" (4 mil) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides.
 3. Waterproofing Accessories:
 - a. Provide Schluter®-KERDI-SEAL Mixing Valve seals.
 - b. Provide Schluter®-KERDI-SEAL pipe seals.

2.06 UNCOUPLING MEMBRANE

- A. Schluter®-DITRA or approved equal.
 1. Description: 1/8" (3 mm) thick, orange, high-density polyethylene membrane with a grid structure of 1/2" x 1/2" (12 mm x 12 mm) square cavities, each cut back in a dovetail

- configuration, and a polypropylene anchoring fleece laminated to its underside. Conforms to definition for uncoupling membranes in the Tile Council of North America Handbook for Ceramic Tile Installation; and meets or exceeds the requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10," and is listed by cUPC®, and is evaluated by ICC-ES (see Report No. ESR-2467 and PMG 1204).
2. Manufacturer: Schluter Systems, L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841. Tel.: (800) 472-4588. Fax: (800) 477-9783. E-mail: specassist@schluter.com. Internet: www.schluter.com.
 3. Waterproofing seaming membrane:
 - a. Provide with Schluter®-KERDI-BAND Seams and Corners material 0.004" (4 mil) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides.
- B. Schluter®-DITRA-XL or approved equal.
1. Description: 9/32" (7 mm) thick, orange, high-density polyethylene membrane with a grid structure of 1/2" x 1/2" (12 mm x 12 mm) square cavities, each cut back in a dovetail configuration, and a polypropylene anchoring fleece laminated to its underside. Conforms to definition for uncoupling membranes in the Tile Council of North America Handbook for Ceramic Tile Installation; and meets or exceeds the requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10," and is listed by cUPC®, and is evaluated by ICC-ES (see Report No. ESR-2467 and PMG 1204).
 2. Waterproofing seaming membrane:
 - a. Provide with Schluter®-KERDI-BAND Seams and Corners material 0.004" (4 mil) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides.
- C. MAPEI Mapeguard UM
1. Description: Premium-performance, lightweight, waterproofing and vapor-pressure-equalizing underlayment membrane that provides crack suppression for use under ceramic tile and stone installations as well as underneath self-leveling engineered cement products. Provides reduced "roll memory" and is also "fast track ready" over green concrete and mortar beds.
 2. Waterproofing seaming membrane:
 - a. Provide with Mapeguard ST
- D. MAPEI Mapeheat Membrane (for Thicker Application needs)
1. Description: 7/32" (5.5 mm) thick, blue, high-density polyethylene membrane with a grid structure of 11/8' x 11/8" (27 mm x 27 mm) square cavities, each cut back in a dovetail configuration, and a polypropylene anchoring fleece laminated to its underside. Conforms to definition for uncoupling membranes in the Tile Council of North America Handbook for Ceramic Tile Installation; and meets or exceeds the requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10," and A118.12
 2. Waterproofing seaming membrane:
 - a. Provide with MAPEI Mapeguard ST Seam material, for floors, walls, inside and Outside corners. Mapeguard ST is a blue polyethylene membrane, with polypropylene fleece laminated on both sides.

2.07 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Laticrete International, Inc.

- b. MAPEI Corporation; Keraflex Super
 - c. TEC; a subsidiary of H. B. Fuller Company.
 2. Provide prepackaged, dry-mortar mix containing dry, redispersable, vinyl acetate or acrylic additive to which only water must be added at Project site.
 3. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site.
 4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- B. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
1. Applications: Where indicated on drawings.
 2. Products:
 - a. Custom Building Products; EBM-Lite Epoxy Bonding Mortar: www.custombuildingproducts.com/#sle.
 - b. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com/#sle.
 - c. MAPEI Corporation; Kerapoxy 410
 - d. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.

2.08 GROUT MATERIALS

- A. Polymer-Modified Tile Grout: ANSI A118.7.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation; Ultracolor Plus FA
 - c. TEC; a subsidiary of H. B. Fuller Company.
 2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersable form, prepackaged with other dry ingredients.
 3. Polymer Type: Acrylic resin in liquid-latex form for addition to prepackaged dry-grout mix.
- B. Water-Cleanable Epoxy Grout: ANSI A118.8, 100 percent solids with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D. Use in Toilet Room Floor installations.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. TEC; a subsidiary of H. B. Fuller Company.
 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, and certified by manufacturer for intended use.
- C. Grout for Pre-grouted Tile Sheets: Same product used in factory to pre-grout tile sheets.

2.09 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 - JOINT SEALANTS.
1. Sealants shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
- C. Multi-part, Pourable Urethane Sealant for Use T: ASTM C920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Degussa Building Systems; Sonneborn Sonolastic SL 2.
 - b. Pecora Corporation; Dynatrol II-SG.
 - c. Sika Corporation; Sikaflex-2c SL.
 - d. Tremco Incorporated.; Vulkem 245.

2.10 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A666, 300 Series exposed-edge material.
- C. Decorative Color Coated Tile Edge and Finishing Profiles: Schluter®-RONDEC, symmetrically rounded visible surface with 1/4" radius bullnose profiles with integrated trapezoid-perforated anchoring leg and integrated grout joint spacer; extruded aluminum with color-coated finish color and height as selected by the architect. Provide inside and outside corner connectors and special shapes for a complete installation.
- D. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
 - a. MAPEI Corporation; "UltraCare" Grout Release
- E. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
 - 1. Products:
 - a. MAPEI Corporation; "UltraCare" Everyday Stone, Tile & Grout Cleaner
- F. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
 - 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. Bonsal American; an Oldcastle company; Grout Sealer.
 - b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer.
 - c. C-Cure; Penetrating Sealer 978.
 - d. Custom Building Products; Grout and Tile Sealer.
 - e. Jamo Inc.; Penetrating Sealer.
 - f. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
 - g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
 - h. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
 - i. TEC; a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

2.11 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Protect surrounding work from damage.
- C. Remove any curing compounds or other contaminants.
- D. Vacuum clean surfaces and damp clean.
- E. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1a and is sloped 1/4 inch per foot (1:50) toward drains.
- F. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

- G. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, pre coat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.03 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
 - c. Tile floors composed of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
 - 4. For Plank type tiles, install staggered in a "running bond" brick joint pattern with no more than 33 % overlap to prevent lippage and warping.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/8 inch (1.6 mm).
 - 2. Porcelain Floor Tile: 3/16 inch (4.8 mm) minimum.
 - 3. Paver Tile: 1/8 inch.
 - 4. Glazed Porcelain Wall Tile: 1/8 inch (4.8 mm).
 - 5. Decorative Thin Wall Tile: 1/8 inch (1.6 mm).
 - 6. Quarry Tile: 1/4 inch (6.3 mm)
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.
- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
 2. Do not extend waterproofing or crack isolation membrane under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing or crack isolation membrane with elastomeric sealant.
- J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- K. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.04 TILE BACKING PANEL INSTALLATION

- A. Install cementitious backer units and treat joints according to ANSI A118.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.05 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.06 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. For epoxy grout installations utilize recommended grout haze cleaner as recommended by the tile manufacturer. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed. After seven days, cover areas subject to construction traffic with heavy cardboard.

- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.07 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Tile Installation F115A: Thin-set mortar; epoxy grout; TCNA F115A.
 - a. Tile Type: Glazed Porcelain floor tile.
 - b. Thin-Set Mortar: Latex- portland cement mortar.
 - c. Grout: Water-cleanable epoxy grout.
- B. Interior Wall Installations, Metal Studs or Furring:
 - 1. Tile Installation W244: Thin-set mortar on cementitious backer units or fiber cement underlayment; TCNA W244F.
 - a. Tile Type: Glazed Porcelain wall tile.
 - b. Thin-Set Mortar: Latex- portland cement mortar.
 - c. Grout: Polymer-modified sanded grout.

END OF SECTION 093013

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 acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of full-size Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch (150-mm) long Samples of each type, finish, and color.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component including decorative moldings, equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.08 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.09 WARRANTY

- A. Provide manufacturer's 30-year limited systems warranty covering defects in materials and / or factory workmanship for ceiling panels and suspension systems.
- B. Provide manufacturer's 10-year limited warranty covering sagging and warping defects caused by materials or factory workmanship for Humidity and Moisture-resistant ceiling systems.
- C. Provide manufacturer's 1-year limited warranty covering defects in materials and / or factory workmanship for Acoustical canopy ceiling systems.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E84 testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.

2.02 ACOUSTICAL PANELS, GENERAL

- A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.
- C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- D. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- E. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E795.
- F. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.03 ACOUSTICAL PANELS (ULTIMA)

- A. Basis-of-Design Product Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Armstrong World Industries, Inc.: Ultima 1912HRC
 2. Or approved equal.
- B. Classification: Provide panels complying with ASTM E1264 for type, form, and pattern as follows:
1. Type and Form: Type IX, mineral base with factory-applied latex paint; Form 2, water felted; with Durabrite acoustically transparent membrane. .
 2. Pattern: As indicated by manufacturer's designation.
- C. Color: White.
- D. LR: ASTM E1477; Not less than 0.90.
- E. NRC: ASTM C423; Not less than 0.70.
- F. CAC: ASTM C1414; Not less than 35.
- G. Articulation Class (AC): ASTM E1111/E1111M; Classified with UL label.
- H. Edge/Joint Detail: Beveled Tegular.
- I. Thickness: 3/4 inch (19 mm).
- J. Modular Size: 24 by 24 inches (610 by 610 mm).
- K. Mold/Mildew Inhibitor: Front and Back of each panel shall be treated with BioBlock, paint containing a biocide to inhibit / retard the growth of mold or mildew, ASTM D3273.

2.04 SPECIAL USE CEILING PANELS

- A. Basis-of-Design Product Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Armstrong World Industries, Inc.: Clean Room VL 868 (2' x 2')
 2. Or approved equal.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
1. Type and Form: Type IV, wet-formed mineral fiber with latex paint face; Form 2, water felted; with Durabrite acoustically transparent membrane. Anti-Mold / Mildew with BioBlock coating.
 2. Performance Characteristics:

- a. Anti Mold & Mildew.
 - b. Sag Resistant.
 - c. Water Repellent.
 - d. Washable.
 - e. Scratch Resistant.
 - f. Soil Resistant.
 - g. Recycled Content (36%).
3. Pattern: Pattern G or as indicated by manufacturer's designation.
- C. Color: White.
- D. LR: Not less than 0.83
- E. NRC: N/A for unperforated.
- F. Fire Class: Class A
- G. CAC: Not less than 35.
- H. R Value: 1.5
- I. Edge/Joint Detail: Square.
- J. Thickness: 5/8 inch.
- K. Modular Size: 24 inch by 24 inch
- L. Warranty: 30 year Performance warranty

2.05 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C635/C635M.
1. High-Humidity Finish: Comply with ASTM C635/C635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- (3.5-mm-) diameter wire.
- E. Hanger Rods Flat Hangers: 1/4 inch diameter, Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

- G. Cold Rolled Channel: 1 1/2 inch deep, 16 MSG cold rolled steel with protective zinc coating. Tie to supporting structure with 12 SWG galvanized wire ties. Install at 4'-0" o.c. maximum or as indicated on the drawings.
- H. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- J. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place. Conform to "Code of Practices for Acoustical Ceiling System Installations" by CISCA - Ceilings & Interior Systems Contractors Association.
- K. Hold-Down Clips: Provide manufacturer's standard hold-down clips (Armstrong CHDC or equal) spaced 24 inches (610 mm) o.c. on all cross tees. At exterior locations provide Exterior Hold Down Clips in size determined by the panel thickness (Armstrong EHDC or equal).
- L. Retention Clips: Provide Armstrong 414 Retention Clips in Gymnasium and Activity spaces. Install as recommended by the manufacturer to secure each panel.
- M. Shadow Reveal Transition Molding: Provide in size to match the adjacent grid field in 10 foot lengths, 1 1/4" height and width as determined by field grid. Armstrong 7901 for 9/16" grid and 7902 for 15/16" grid.
- N. Canopy system installations shall be as recommended by the manufacturer. Panels shall not be field altered, drilled or cut.
 - 1. Provide a minimum of 18 inches between panels.
 - 2. Panels shall not be field painted.
 - 3. Hanging system shall not be tied to another commercial suspension system. Hang system from building structure in accordance with the manufacturer's specifications.

2.06 METAL SUSPENSION SYSTEM - 15/16 GRID

- 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:
- B. Basis-of-Design Product Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.: Prelude.
 - 2. CertainTeed Corp.
 - 3. Chicago Metallic Corporation.
- C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 15/16-inch (24 mm) wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Grid and Cap Material: Hot-dip galvanized steel with Aluminum cap.
 - 5. Cap Finish:
 - a. White for acoustical panel installations.

- D. Suspended Ceiling Grid Moldings: StyleStix™ - Rigid PVC; Sag, mold, mildew and bacteria resistant; snap-on grid and perimeter moldings (Items #1310, 1311 and 1312) in lengths required. System connects to a standard 15/16" grid suspension system with wall molding profile. The StyleStix system shall have the following physical characteristics:
1. Dimensions: 1 1/2 inch wide x 3/4 inch deep x 72 inch long (#1310)
 2. Sag Resistance: HumiGuard Plus.
 3. Fire Rating: Class A
 4. Anti-microbial: Mold, Mildew and Bacteria resistant
 5. Durability: Soil, scratch and impact resistant
 6. Material: PVC
 7. Finish: White, paintable surface.
 8. Warranty: Limited Lifetime manufacturer's warranty.

2.07 METAL EDGE MOLDINGS AND TRIM

- 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:
- B. Basis-of-Design Product : Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Armstrong World Industries, Inc.
 2. Chicago Metallic Corporation.
 3. USG Interiors, Inc.; Subsidiary of USG Corporation.
- C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.08 ACOUSTICAL SEALANT

- 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. Acoustical Sealant for Exposed and Concealed Joints
 - a. Pecora Corporation ; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation: SHEETROCK Acoustical Sealant.
- B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C636/C636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Do not attach hangers to steel deck tabs.
 - 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 - 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 - b. Install panels with pattern running in one direction parallel to short axis of space.
 - 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 - 1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and post-installed anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two post-installed anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

- D. Prepare test and inspection reports.

3.05 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

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 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. Room and door identification signs.
 - 2. Roof Truss Identification Signage.
 - 3. Illuminated Address Signage.

1.03 RELATED REQUIREMENTS:

- A. Section 015000 - TEMPORARY FACILITIES AND CONTROLS for temporary Project identification signs and for temporary information and directional signs.

1.04 DEFINITIONS

- A. Accessible: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

1.05 ACTION SUBMITTALS

- A. See Section 013300 - SUBMITTALS.
- B. Product Data: For each type of product.
- C. Shop Drawings: For panel signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
 - 2. Provide manufacturer's full color palette in the form of a color deck or actual samples for selections by the Architect.
- E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Room Identification Signs: Full-size Sample.
- F. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.09 FIELD CONDITIONS

- A. Field Measurements: Verify locations of signage and field mounting surfaces in the field before fabrication, and indicate measurements on Shop Drawings.
- B. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- C. Maintain this minimum temperature during and after installation of signs.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within manufacturers specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANEL SIGNS, GENERAL

- A. Regional Materials: Panel signs shall be manufactured within 500 miles (800 km) of Project site.

2.02 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.03 SIGNS

- A. Manufacturer: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
1. ASI Sign Systems, Inc.
 2. Best Sign Systems Inc.
 3. Mohawk Sign Systems.
 4. Precision Signs.
 5. Kichler.
- B. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Basis-of-Design Product: ASI Sign Systems, Inc.; InTac.
 2. Laminated-Sheet Sign: Sandblasted polymer face sheet with raised graphics laminated over subsurface graphics to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: 0.125 inch (3.18 mm).
 - b. Surface-Applied Graphics: Applied vinyl film paint.
 - c. Subsurface Graphics.
 3. Mounting: Surface mounted to wall with concealed anchors two-face tape.
 4. Surface Finish and Applied Graphics:
 - a. Integral Sheet Color: As selected by Architect from full range of industry colors.
 - b. Painted Finish and Graphics: Manufacturer's standard, factory-applied acrylic polyurethane, in color as selected by Architect from manufacturer's full range.
 5. Text and Typeface: Accessible raised characters and Braille Tags: Clear raster balls shall be drilled and tapped using ASI's Intac procedure and InTac Braille guide.
 6. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch (1.5 mm) Insert dimension measured diagonally from corner to corner.
- C. Room Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Basis-of-Design Product: ASI Sign Systems, Inc.; InTac.
 2. Laminated-Sheet Sign: face sheet with raised graphics laminated to backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: As indicated Manufacturer's standard for size of sign 0.125 inch (3.18 mm).
 - b. Surface-Applied Graphics: Applied Graphics, Lettering and/or numerals: LPP Series individual, Acrylic. Dimensional Characters. Individual cut Acrylic letters (1/32 inch thick) with matte finish.
 - c. Subsurface Graphics: Subsurface painted Acrylic, .125 inch thick, matte first finish.
 - d. Grade 2 Braille Tags: Clear raster balls shall be drilled and tapped using ASI's Intac procedure and InTac Braille guide.
 - e. Color(s): As selected by Architect from manufacturer's full range.
 3. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: Radius.
 4. Mounting: Manufacturer's standard method for substrates indicated with concealed anchors as selected by the Architect.
 5. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range.

2.04 PANEL-SIGN MATERIALS

- A. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.
- B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.05 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use screws and bolts with tamper-resistant spanner-head slots unless otherwise indicated.
 - 4. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
- B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.06 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 4. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

2.07 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Room Identification Signs and Other Accessible Signage: Install in locations on walls as indicated and according to ADAAG accessibility standards.
- C. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - 2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
 - 3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of

suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
 5. Mount signs in accordance with the manufactures specifications using non-corrosive vandal-resistant fasteners finished to match adjacent sign material.
- D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.03 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

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-polymer toilet compartments configured as toilet compartment enclosures and urinal screens.
 - 2. Partition Style:
 - a. Floor Anchored / Overhead Braced.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
 - 3. Show locations of centerlines of toilet fixtures.
- C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.
- D. Manufacturer's Warranty: Manufacturer's standard 15 -year limited warranty for panels, doors and stiles against breakage, corrosion, delamination and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

1.04 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment, from manufacturer.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
- B. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.
- C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Class A flame spread/smoke developed rating, tested to ASTM E84.

- D. Material Fire Ratings:
 - 1. National Fire Protection Association - NFPA 286: Pass.
 - 2. International Code Council (ICC): Class B.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC A117.1 for toilet compartments designated as accessible.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

1.08 WARRANTY

- A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: ASTM B221.
- C. Brass Castings: ASTM B584.
- D. Brass Extrusions: ASTM B455.
- E. Stainless-Steel Castings: ASTM A167, Type 304
- F. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.02 SOLID-POLYMER UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Scranton Products (Basis of Design): 801 E. Corey St. ; Scranton, PA 18507; Toll Free Tel: 800-445-5148.
 - 2. ASI Global.
 - 3. Bradley Corporation.f
- B. Toilet Enclosure Style: Floor Anchored/Overhead Braced.
- C. Entrance-Screen Style: Floor Anchored/Overhead Braced.
- D. Urinal-Screen Style: Wall Hung. Urinal Screen size(s) shall be as indicated on the drawings.
- E. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) or panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.

1. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
 2. Color, Texture and Patterns: Colors, Textures and Patterns in each room as selected by Architect from manufacturer's full range.
- F. Pilaster Shoes and Sleeves (Caps):
1. Three Inch high manufacturer's standard design; 14 gauge, Type 304 stainless steel secured to pilaster with stainless steel tamper-resistant Torx head sex bolt.
 2. Three inch high manufacturer's standard design Polymer Color and Pattern: Matching or Contrasting with pilaster, as selected by Architect from manufacturer's full range.
- G. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters ; with shoe and sleeve (cap) matching that on the pilaster.
- H. Brackets (Fittings):
1. Full-Height (Continuous) Type:
 - a. Polymer as indicated on the drawings.
 - 1) Polymer Color, Texture and Patterns: Matching or Contrasting with panel, as selected by the Architect from the manufacturer's full color offering.
 - b. Extruded heavy-duty aluminum 6463-T5 alloy as indicated on the drawings.
 - c. Stainless steel, Type 304 as indicated on the drawings.
 2. The brackets are fastened to the pilaster with stainless steel tamper resistant Torx head screws and fastened to the panels with stainless steel tamper resistant Torx head sex bolts.
- I. Door Hardware:
1. Continuous aluminum.
 2. Continuous stainless steel helix.
 3. Continuous stainless steel spring hinge.
 4. Vault Hinge: Heavy-duty diecast vault zamac hinge shall have gravity-acting cams and are fabricated from a die cast aluminum alloy with a brushed finish and wrap around flanges. The cam is constructed from $\frac{3}{4}$ " diameter nylon rod and a $\frac{3}{8}$ " stainless steel pin.
 5. Integral Hinges (Stealth): Hinges shall be integral, fabricated in the door and pilaster with no exterior exposed metal parts. Hinges operate with field adjustable nylon cams. Cams can be field adjusted to any degree.
 6. Wrap-Around Hinges: Hinges shall be 8 inches (203 mm) and fabricated from heavy-duty extruded aluminum wrap-around hinges through-bolted to pilasters and doors with stainless steel tamper resistant Torx head sex bolts. Hinges operate with field adjustable nylon cams. Cams can be field set in 30, 60 or 90-degree increments.
 7. Wrap-Around Hinges (Regal): Hinges shall be fabricated from heavy-duty cast aluminum, wrap around flanges through bolted to doors and pilasters. Hinges operate with field adjustable nylon cams. Cams can be field set in 30, 60 or 90-degree increments.
 8. Latches:
 - a. Aluminum Slide Bolt Latch and housing shall be made of heavy-duty extruded aluminum (6463-T5 alloy). The latch housing shall have a bright dip anodized finish, and the slide bolt and button shall have a black anodized finish.
 - b. Aluminum Paddle Latch and housing shall be made of heavy-duty extruded aluminum (6463-T5 alloy). The latch housing and paddle shall have a bright dip anodized finish.
 - c. Stainless Steel Slide Bolt Latch and housing shall be made of heavy-duty stainless steel type 304. The latch housing shall have a bright finish, and the slide bolt and button shall have a black anodized finish.
 - d. Stainless Steel Paddle Latch and housing shall be made of heavy-duty stainless steel type 304. The latch housing and paddle shall have a bright finish.
 - e. Provide occupancy indicator.

9. Door strike/keeper shall be made of heavy-duty extruded aluminum (6436-T5 alloy) with a bright dip anodized finish and secured to the pilasters with stainless steel tamper resistant Torx head sex bolts. Bumper shall be made of extruded black vinyl.
 - a. Style: 3 inches (76 mm) stainless steel emergency access.
10. Each door shall be supplied with one coat hook/bumper and door pull made of chrome plated Zamak.
11. Equip outswing handicapped doors with second door pull and door stop.

2.03 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
 1. Material: Clear anodized aluminum.
 2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees. Note: Door hardware shall enable emergency access from the exterior of the toilet stall unit for emergency access purposes.
 3. Latch and Keeper: Manufacturer's standard latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance-screen doors.
 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, heavy-duty extruded aluminum (6463-T5 alloy) head rail with anti-grip profile and in manufacturer's standard finish shall be fastened to the headrail bracket by a stainless steel tamper resistant Torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.
 1. Headrail brackets shall be 20 gauge stainless steel with a satin finish and secured to the wall with a stainless steel tamper resistant Torx head screws.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.
 1. Masonry Anchors: Type H/S Drop-In Anchors by the Rawlplug Co., Inc., New Rochelle, NY 10802.

2.04 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch (610-mm) wide, in-swinging doors for standard toilet compartments and 36-inch (914-mm) wide, out-swinging doors with a minimum 32-inch (813-mm) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Examine areas to receive toilet partitions, screens, and shower compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the architect.

3.02 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 3/8 inch (9.5 mm).
 - b. Panels and Walls: 1 inch (25 mm).
 - 2. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.
 - 3. Finished surfaces shall be cleaned after installation and be left free of imperfections.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches (51 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.03 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors in closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Replace all damaged products including adjacent finish surfaces before Substantial Completion.

END OF SECTION 102113.19

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. Public-use washroom accessories.
 - 2. Miscellaneous Bathroom Accessories
 - 3. Lavatory Child Step Stool.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.

1.04 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty requirements listed under this section.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals. Manufacturer's service and parts manual shall be provided to the owner upon completion of project.
- B. All keyed toilet accessories shall be keyed alike. Six keys shall be provided to the Owner.

1.06 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts, and anchoring devices set into back-up construction as required to prevent delaying the Work.

1.07 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion for Toilet Accessories and Hand Dryer units. Mirror reflective surfaces shall be warranted for a period of 15 years against silver spoilage.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Stainless Steel: ASTM A666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated. 65-70% post-recycled content.
- B. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot-dip zinc coating.
- C. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- E. Mirrors: ASTM C1048, Tempered Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.02 WASHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Bobrick Washroom Equipment, Inc.
 2. American Specialties, Inc.
 3. Bradley Corporation
- B. Toilet Tissue (Roll) Dispensers:
 1. Basis-of-Design Product: Bobrick Model B-4288.
 - a. Description: Double-roll dispenser
 - b. Mounting: Surface mounted.
 - c. Operation: Unit shall be equipped with two theft-resistant, heavy-duty, one-piece, Theft-resistant molded ABS spindles.
 - d. Capacity: Designed for up to 5 1/8 inch- diameter tissue rolls.
 - e. Material and Finish: Type 304 Stainless steel, No. 4 finish (satin).
 - f. Lockset: Tumbler type. Keyed alike to all other Toilet Accessories.
 - g. Refill Indicator: Pierced slots at front.
- C. Combination Towel Dispenser/Waste Receptacles:
 1. Basis-of-Design Product: Kimberly Clark Model 31501 Recessed Dispenser & 35370 Recessed Trash Receptacle.
 - a. Description: Combination unit for dispensing preset length of roll paper towels, with removable waste receptacle. Paper towel dispenser shall dispense 1150 foot roll of 8" paper towel material. Cabinet shall be 18-8, type 304 heavy gauge stainless steel, welded construction with satin finish.
 - b. Flange, Skirt and Door shall be fabricated from 18-8, type 304, 22 gauge stainless steel with satin finish. Door shall have double pan back construction.
 - c. Mounting: Surface mounted. Provide stainless steel finishing collar in depth required by wall construction. Provide matching filler channels to fill the gap above tile wainscots on each side and top edge of each unit
 - d. Door shall be mounted with full-length stainless steel piano hinge.
 - e. Minimum Waste Receptacle Capacity: 9.22 gal. with all handling edges hemmed for safe handling.
 - f. Material and Finish: Type 304 Stainless steel, No. 4 finish (satin).

- g. Liner: Reusable, vinyl waste-receptacle liner.
 - h. Lockset: Tumbler type for towel dispenser compartment and waste receptacle. Keyed alike to all other locking toilet accessories.
- D. Surface Mounted Foam Tank Type Vertical:
- 1. Basis-of-Design Product: Bradley Model No. 6A01-11
 - a. Description: Designed for dispensing foam hand sanitizer. touchless, battery operated
 - b. Mounting: Vertically oriented; surface-mounted.
 - c. Capacity: 27 oz.
 - d. Materials: Type 304 Stainless steel, 20 gauge, No. 4 finish (satin), welded construction. 22 gauge stainless steel backplate with 20 gauge stainless steel mounting bracket.
 - e. Lockset: Tumbler type. Keyed alike to all other Toilet Accessories.
 - f. Refill: Vandal-resistant filler hole cover and sight gauge
- E. Grab Bars:
- 1. Basis-of-Design Product: Bobrick Model B-6806-Series.
 - a. Mounting: Flanges with concealed vandal resistant fasteners.
 - b. Material: Stainless steel, 0.05 inch thick.
 - c. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant, satin-finish texture in grip area.
 - d. Outside Diameter: 1-1/2 inches (38 mm).
 - e. Configurations and Lengths: As indicated on Drawings. Concealed mounting flanges shall be 1/8" thick stainless steel plate, 2" x 3-1/8", and equipped with two screw holes for attachment to wall. Flange covers shall be 22 gauge, 3-1/4" diameter x 1/2" deep, and shall snap over mounting flange to conceal mounting screws and/or wingtip fasteners. Ends of grab bar shall pass through concealed mounting flanges and be heliarc welded to form one structural unit. Clearance between the grab bar and wall shall be 1-1/2".
 - f. Grab bars shall comply with barrier-free accessibility guidelines (including ADAAG and ICC 117.1.) for structural strength and configurations.
- F. Sanitary-Napkin Disposal Units:
- 1. Basis-of-Design Product: Bobrick Model B-270.
 - a. Mounting: Surface mounted.
 - b. Door or Cover: Drawn, one-piece construction secured with a continuous piano hinge.
 - c. Receptacle: 1.0 gallon capacity.
 - d. Material and Finish: Stainless steel, No. 4 finish (satin).
- G. Mirror Units:
- 1. Basis-of-Design Product: Bobrick Model B-290 & B-293 (ADA) 1830-Series
 - a. Frame: Type 304 Stainless-steel angle, 0.05 inch (1.3 mm) thick .Mirror shall have a one-piece, type-304 stainless steel angle frame, 3/4" x 3/4" (19 x 19mm) with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror. All exposed surfaces shall have satin finish with vertical grain
 - 1) Corners: Heliarc Welded and ground smooth.
 - b. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - 1) One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - 2) Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

- c. Size: As indicated on Drawings. Provide 18" wide x 30" long units with mounting height to reflective surface at 40" above finish floor for ADA accessible lavatories.
- d. All mirror edges shall be protected by plastic filler strips and the back shall be protected by full-size, shock-absorbing, water-resistant, nonabrasive, 3/16" (5mm) thick polyethylene padding.
- e. Mirror: 1/4" tempered glass mirror with galvanized steel back.

H. Lavatory Child Step Stool

- 1. Basis of Design: Step N' Wash SNW-SS 975B or approved equal.
 - a. Model: Self-Retracting Step
 - b. Step Material: step constructed from 18 gauge type 304 stainless steel with non-slip rubber tread
 - c. Side Support Material: side supports constructed from 14 gauge, type 304 stainless steel, reinforced with stainless steel plate
 - d. Capacity: load capacity of 800 lbs
 - e. Operation: concealed gas cylinder provides controlled lowering and automatic retraction of step
 - f. Mounting: floor mounted
 - g. Mounting Kit: four stainless steel wedge anchors included for secured installation under lavatory

2.03 MISCELLANEOUS BATHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. Bradley Corporation.

2.04 WARM-AIR DRYERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. Excel Dryer Inc.
 - 3. Dyson
 - 4. World Dryer.
 - 5. Or approved equal.
- B. Warm Air Hand Dryers:
 - 1. Basis-of-Design Product: Excel Dryer - XLERATOR warm air, rapid drying, energy efficient electric hand dryer. 1.1 noise reduction nozzle reducing air deflection noise and decibel level by 9db.
 - a. Nominal Size: 11-3/4 inches wide by 12-11/16 inches high by 6-11/16 inches deep.
 - b. Mounting: Provide Model 40502 recess accessory for ADA compliant surface mounted hand dryers(to provide less than 4" projection). Unit Size: 14 3/8 inch wide x 24 1/8 inch height x 3 1/8 inch deep recess with 1/4 inch deep flange. Overall size: 16 3/8 inch wide x 26 inch height x 3 3/8 inch deep. Mount bottom of recess 10 inches below dryer mounting height.
 - c. Operation: Electronic-sensor activated when hands are held under the air-outlet opening and across path of sensor. Dryer stops when hands are removed from the sensor path. Dryer operates only when drying is taking place. Shut-off within 2 seconds when hands removed or in 35 seconds if hands not removed.
 - d. Combination Motor and Blower: Series commutated, through-flow discharge, vacuum type; 5/8 HP, 20,000 RPM. Air flow rate: 19,000 linear feet per minute (97 meters per

second) at air outlet, 16,000 linear feet per minute (81 meters per second) at average hand position of 4 inches (102 mm) below air outlet.

- e. Heater: Nichrome wire element, mounted inside blower housing to be vandal proof.
- f. Heater Safeguard: Automatic resetting thermostat to open when air flow is restricted and close when air flow is resumed.
- g. Mount dryer at a height to comply with ADA requirements for operation (48 inches for adults (Universal Design), 40 inches for children (ages 5-8) and 44 inches for children (ages 9 to 12).
- h. Cover Material and Finish: Stainless steel with brushed finish
- i. Electrical Requirements: 110-120V, 11.3 - 12.2A, 1240 - 1450W (Heat); 4.3 - 4.5A (No Heat), 460-530W (No Heat), 50/60 Hz
- j. Warranty: 5-year Limited warranty.

2.05 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.02 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

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 surface material countertops.

1.03 ACTION SUBMITTALS

- A. Comply with Section 013300 - SUBMITTALS.
- B. Product Data: For countertop materials.
- C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- D. Samples for Initial Selection: For each type of material exposed to view.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.

1.07 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.08 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.01 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. E. I. du Pont de Nemours and Company: Corian
 - b. Or approved equal.
 - 2. Colors and Patterns: As selected by Architect from manufacturer's full range.
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.02 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Premium.
- B. Configuration:
 - 1. Front: Radius edge with apron - 2 inch high with 1/4 inch radius.
 - 2. Backsplash: Straight, with 1/4 inch radius top edge and vertical corner edges.
 - 3. End Splash: None.
- C. Countertops: 3/4 inch thick, solid surface material.
- D. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes for field assembly.
 - 2. Install integral sink bowls in countertops in the shop.
- E. Joints: Fabricate countertops without joints.
- F. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
 - b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.
 - c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.
 - 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.03 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
 - 1. Adhesives shall have a VOC content of 70 g/L or less.

2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 - JOINT SEALANTS.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten subtops to cabinets by screwing through subtops into wall cleats. Shim as needed to align subtops in a level plane.
- C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- E. Install backsplashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- F. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Pre-drill holes for screws as recommended by manufacturer.
- G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- H. Apply sealant to gaps at walls; comply with Section 079200 - JOINT SEALANTS.

END OF SECTION 123661.16

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.

1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. EJMA (STDS) - EJMA Standards; Tenth Edition.
- B. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
 - 2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
- C. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.
- D. Maintenance Data: Include adjustment instructions.
- E. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Comply with UL (DIR) requirements.

2.02 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

- A. Manufacturers:
 - 1. Mercer Rubber Company: www.mercer-rubber.com/#sle.
 - 2. The Metraflex Company: www.metraflex.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Inner Hose: Carbon steel.
- C. Exterior Sleeve: Single braided, stainless steel.

- D. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).
- E. Joint: Flanged.
- F. Size: Use pipe sized units.
- G. Maximum offset: 3/4 inch (20 mm) on each side of installed center line.

2.03 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

- A. Manufacturers:
 - 1. Mercer Rubber Company: www.mercer-rubber.com/#sle.
 - 2. The Metraflex Company: www.metraflex.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Inner Hose: Bronze.
- C. Exterior Sleeve: Braided bronze.
- D. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).
- E. Joint: Flanged.
- F. Size: Use pipe sized units.
- G. Maximum offset: 3/4 inch (20 mm) on each side of installed center line.
- H. Application: Copper piping.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.
- C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- E. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.
- G. Substitute grooved piping for vibration isolated equipment instead of flexible connectors. Grooved piping need not be anchored.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 220523 - General-Duty Valves for Plumbing Piping.
- C. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.
- D. Section 220719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified this section.
 - 1. Minimum three years experience.
 - 2. Approved by manufacturer.
- C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Manufacturers:
 - 1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
 - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
 - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- C. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- D. Pipe Passing Through Below Grade Exterior Walls:
 - 1. Zinc coated or cast iron pipe.
 - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- E. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
 - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
 - 2. Connect sleeve with floor plate except in mechanical rooms.
- F. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
 - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
 - 2. Connect sleeve with floor plate except in mechanical rooms.
- G. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect/Engineer.
- H. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.
 - 3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- E. Structural Considerations:
 - 1. Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 - 1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
 - 2. Aboveground Piping:
 - a. Pack solid using mineral fiber complying with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch (12.7 mm) where penetrations occur between conditioned and unconditioned spaces.
 - 3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
 - 4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Applications.
- B. Ball valves.
- C. Check valves.
- D. Gate valves.
- E. Plug valves.

1.02 RELATED REQUIREMENTS

- A. Section 220719 - Plumbing Piping Insulation.
- B. Section 221005 - Plumbing Piping.

1.03 ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. SWP: Steam working pressure.
- I. TFE: Tetrafluoroethylene.
- J. WOG: Water, oil, and gas.

1.04 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013 (Reaffirmed 2018).
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- C. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2017.
- E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
- F. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2017.

- G. ASME B31.9 - Building Services Piping; 2017.
- H. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- I. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
- J. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- K. AWWA C606 - Grooved and Shouldered Joints; 2015.
- L. MSS SP-45 - Bypass and Drain Connections; 2003 (Reaffirmed 2008).
- M. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.
- N. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- O. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- P. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- Q. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.
- E. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.

2. Protect valve parts exposed to piped medium against rust and corrosion.
 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
 4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
 5. Secure check valves in either the closed position or open position.
 6. Adjust butterfly valves to closed or partially closed position.
- B. Use the following precautions during storage:
1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
 2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors in dry environment.
 - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. See drawings for specific valve locations.
- B. Provide the following valves for the applications if not indicated on drawings:
1. Shutoff: Ball, butterfly, gate or plug.
 2. Dead-End: Single-flange butterfly (lug) type.
 3. Throttling: Provide globe, angle, ball, or butterfly.
 4. Swing Check (Pump Outlet):
 - a. 2 NPS (50 DN) and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
- C. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.
- D. Required Valve End Connections for Non-Wafer Types:
1. Steel Pipe:
 - a. 2 NPS (50 DN) and Smaller: Threaded ends.
 - b. 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
 2. Copper Tube:
 - a. 2 NPS (50 DN) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - b. 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
- E. Domestic, Hot and Cold Water Valves:
1. 2 NPS (50 DN) and Smaller:
 - a. Bronze and Brass: Provide with solder-joint ends.
 - b. Bronze Angle: Class 125, bronze disc.
 - c. Ball: One piece, full port, brass with brass trim.
 - d. Bronze Swing Check: Class 125, bronze disc.
 - e. Bronze Gate: Class 125, NRS.
 - f. Bronze Globe: Class 125, bronze disc.
 2. 2-1/2 NPS (65 DN) and Larger:
 - a. Iron, 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Provide with threaded ends.
 - b. Iron Ball: Class 150.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valves in Insulated Piping: With 2 NPS (50 DN) stem extensions and the following features:
 - 1. Gate Valves: Rising stem.
 - 2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: Extended neck.
- D. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 - 3. Pipe Flanges and Flanged Fittings 1/2 NPS (15 DN) through 24 NPS (600 DN): ASME B16.5.
 - 4. Solder Joint Connections: ASME B16.18.
 - 5. Grooved End Connections: AWWA C606.
- E. General ASME Compliance:
 - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 - 2. Solder-joint Connections: ASME B16.18.
 - 3. Building Services Piping Valves: ASME B31.9.
- F. Potable Water Use:
 - 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
 - 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.03 BRASS, BALL VALVES

- A. One-Piece, Reduced-Port with Brass Trim:
 - 1. Comply with MSS SP-110.
 - 2. Body: Forged brass.
 - 3. Ends: Threaded.
 - 4. Seats: PTFE.
 - 5. Stem: Brass.
 - 6. Ball: Chrome-plated brass.
 - 7. Manufacturers:
 - a. Ferguson Enterprises Inc: www.fnw.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.04 BRONZE, BALL VALVES

- A. General:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. One Piece, Reduced Port with Bronze Trim:

1. Comply with MSS SP-110.
2. SWP Rating: 400 psig (2760 kPa).
3. CWP Rating: 600 psig (4140 kPa).
4. Body: Bronze.
5. Ends: Press.
6. Seats: PTFE.
7. Stem: Bronze.
8. Ball: Chrome plated brass.
9. Manufacturers:
 - a. Viega LLC: www.viega.us/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.05 IRON, BALL VALVES

- A. Class 125, Full Port, Stainless Steel Trim:
 1. Comply with MSS SP-72.
 2. CWP Rating: 200 psig (1380 kPa).
 3. Body: ASTM A536, Grade 65-45-12, ductile iron.
 4. Ends: Flanged.
 5. Seats: PTFE.
 6. Operator: Lever, with locking handle.
 7. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com/#sle.
 - b. Ferguson Enterprises Inc: www.fnw.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.06 BRONZE, SWING CHECK VALVES

- A. General:
 1. Fabricate from dezincification resistant material.
 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Class 125: CWP Rating: 200 psig (1380 kPa).
 1. Comply with MSS SP-80, Type 3.
 2. Design: Y-pattern, horizontal or vertical flow.
 3. Body: Bronze, ASTM B62.
 4. Ends: Threaded.
 5. Disc: Bronze.

2.07 BRONZE, GATE VALVES

- A. General:
 1. Fabricate from dezincification resistant material.
 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Rising Stem (RS):
 1. Comply with MSS SP-80, Type I.
 2. Class 125: CWP Rating: 200 psig: (1380 kPa).
 3. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
 4. Ends: Threaded or solder joint joint.
 5. Stem: Bronze.
 6. Disc: Solid wedge; bronze.
 7. Packing: Asbestos free.
 8. Handwheel: Malleable iron, bronze, or aluminum.

2.08 BRONZE, GLOBE VALVES

- A. General:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Class 125: CWP Rating: 200 psig: (1380 kPa).
 - 1. Comply with MSS SP-80, Type 1.
 - 2. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
 - 3. Ends: Threaded joint.
 - 4. Stem: Bronze.
 - 5. Disc: PTFE.
 - 6. Packing: Asbestos free.
 - 7. Handwheel: Malleable Iron.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- D. Install check valves where necessary to maintain direction of flow as follows:
 - 1. Lift Check: Install with stem plumb and vertical.
 - 2. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Support and attachment components for equipment, piping, and other plumbing work.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping; 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- G. MFMA-4 - Metal Framing Standards Publication; 2004.
- H. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1.04 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- D. Installer Qualifications for Field-Welding: As specified in Section 055000.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS**2.01 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
 - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
- C. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
1. Manufacturers:
 - a. Ferguson Enterprises Inc: www.fnw.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - c. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
 2. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
 3. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- D. Riser Clamps:
1. Manufacturers:
 - a. Ferguson Enterprises Inc: www.fnw.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. Provide copper plated clamps for copper tubing support.
 3. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
- E. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
1. Manufacturers:
 - a. Ferguson Enterprises Inc: www.fnw.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - c. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
 2. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.

3. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- F. Anchors and Fasteners:
1. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc: www.us.hilti.com/#sle.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
 - c. Powers Fasteners, Inc: www.powers.com/#sle.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
 2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 5. Hollow Masonry: Use toggle bolts.
 6. Hollow Stud Walls: Use toggle bolts.
 7. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 8. Sheet Metal: Use sheet metal screws.
 9. Wood: Use wood screws.
 10. Plastic and lead anchors are not permitted.
 11. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect/Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect/Engineer, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- G. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- H. Secure fasteners according to manufacturer's recommended torque settings.
- I. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe markers.

1.02 RELATED REQUIREMENTS

- A. Section 099123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Instrumentation: Tags.
- B. Piping: Tags.
- C. Pumps: Nameplates.
- D. Small-sized Equipment: Tags.
- E. Thermostats: Nameplates.
- F. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

3. Seton Identification Products: www.seton.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.
1. Letter Color: White.
 2. Letter Height: 1/4 inch (6 mm).
 3. Background Color: Black.
 4. Plastic: Comply with ASTM D709.

2.03 TAGS

- A. Manufacturers:
1. Advanced Graphic Engraving: www.advancedgraphicengraving.com/#sle.
 2. Brady Corporation: www.bradycorp.com/#sle.
 3. Brimar Industries, Inc: www.pipemarker.com/#sle.
 4. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 5. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 6. Seton Identification Products: www.seton.com/#sle.
 7. Substitutions: See Section 016000 - Product Requirements.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 STENCILS

- A. Manufacturers:
1. Brady Corporation: www.bradycorp.com/#sle.
 2. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com/#sle.
 4. Seton Identification Products: www.seton.com/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.
- B. Stencils: With clean cut symbols and letters of following size:
1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
 2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
 3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.
- C. Stencil Paint: As specified in Section 099123, semi-gloss enamel, colors complying with ASME A13.1.

2.05 PIPE MARKERS

- A. Manufacturers:
1. Brady Corporation: www.bradycorp.com/#sle.
 2. Brimar Industries, Inc: www.pipemarker.com/#sle.
 3. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

5. Seton Identification Products: www.seton.com/#sle.
 6. Substitutions: See Section 016000 - Product Requirements.
- B. Comply with ASME A13.1.
 - C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
 - D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 099123 for stencil painting.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 099123.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- F. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- G. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
 1. Identify service, flow direction, and pressure.
 2. Install in clear view and align with axis of piping.
 3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 221005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.
- B. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.
- C. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2019b.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville Corporation: www.jm.com/#sle.
 - 3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
 - 5. Owens Corning Corporation; VaporWick Pipe Insulation: www.ocbuildingspec.com/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
 - 1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
 - 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- D. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 650 degrees F (343 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- E. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
- F. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

2.03 JACKETS

- A. PVC Plastic.
 - 1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

- a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil (0.25 mm).
 - e. Connections: Brush on welding adhesive.
3. Covering Adhesive Mastic: Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- 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. Install cellular melamine with factory-applied jackets with a manufacturer-approved adhesive along seams, both straight lap joints and circumferential lap joints.
 1. Install seal over seams with factory-approved room temperature vulcanization (RTV) silicone sealant to ensure a positive vapor barrier seal in outdoor and sanitary washdown environments.
- F. Glass fiber 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.
- G. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- H. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- I. Glass fiber 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 adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- J. Inserts and Shields:

1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 3. Insert Location: Between support shield and piping and under the finish jacket.
 4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- K. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.
- L. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.
- 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 (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Flanges, unions, and couplings.
 - 4. Pipe hangers and supports.
 - 5. Ball valves.
 - 6. Butterfly valves.

1.02 RELATED REQUIREMENTS

- A. Section 083100 - Access Doors and Panels.
- B. Section 099113 - Exterior Painting.
- C. Section 099123 - Interior Painting.
- D. Section 220516 - Expansion Fittings and Loops for Plumbing Piping.
- E. Section 220553 - Identification for Plumbing Piping and Equipment.
- F. Section 220719 - Plumbing Piping Insulation.
- G. Section 312316 - Excavation.
- H. Section 312323 - Fill.
- I. Section 330110.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
- C. ASME B31.9 - Building Services Piping; 2017.
- D. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- F. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2017.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- H. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.

- J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2018.
- K. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- L. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- M. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.
- N. AWWA C606 - Grooved and Shouldered Joints; 2015.
- O. AWWA C651 - Disinfecting Water Mains; 2014.
- P. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2017 (Revised 2018).
- Q. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2012 (Revised 2018).
- R. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.
- S. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2015.
- T. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.
- U. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.
- V. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.
- W. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- X. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- Y. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Welders' Certificates: Submit certification of welders' compliance with ASME BPVC-IX.
- D. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
- E. Sustainable Design Documentation: For soldered copper joints, submit installer's certification that the specified installation method and materials were used.

- F. Project Record Documents: Record actual locations of valves.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.03 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.
 - a. Manufacturers:
 - 1) Apollo Valves: www.apollovalves.com/#sle.
 - 2) Grinnell Products: www.grinnell.com/#sle.
 - 3) Viega LLC: www.viega.us/#sle.
 - 4) Substitutions: See Section 016000 - Product Requirements.

2.04 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
 2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch (25 mm):
 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
 1. Dimensions and Testing: In accordance with AWWA C606.
 2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
 3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
 4. When pipe is field grooved, provide coupling manufacturer's grooving tools.
 5. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com/#sle.
 - b. Grinnell Products: www.grinnell.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.05 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 4. Vertical Pipe Support: Steel riser clamp.
 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
 6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
 - a. Bases: High-density polypropylene.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

- d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
 - e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 3. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
 4. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 3. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.
 4. Hangers for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
 5. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
 6. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
 7. Wall Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
 8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 9. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
 10. Floor Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
 11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
 6. Other Types: As required.

2.06 BALL VALVES

- A. Manufacturers:
1. Apollo Valves: www.apollovalves.com/#sle.
 2. Grinnell Products: www.grinnell.com/#sle.
 3. Nibco, Inc: www.nibco.com/#sle.
 4. Uponor, Inc: www.uponorengineering.com/#sle.
 5. Viega LLC: www.viega.us/#sle.
 6. Substitutions: See Section 016000 - Product Requirements.

- B. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- 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.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 220516.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
 - 1. See Section 220719.
- H. Provide access where valves and fittings are not exposed.
 - 1. Coordinate size and location of access doors with Section 083100.
- I. Establish elevations of buried piping outside the building to ensure not less than 3 ft (0.9144 m) of cover.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
 - 1. See Section 099123 for painting of interior plumbing systems and components.
 - 2. See Section 099113 for painting of exterior plumbing systems and components.
- M. Excavate in accordance with Section 312316.

- N. Backfill in accordance with Section 312323.
- O. Install bell and spigot pipe with bell end upstream.
- P. Install valves with stems upright or horizontal, not inverted. See Section 220523.
- Q. Install water piping to ASME B31.9.
- R. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- S. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- T. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.
 - 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - a. Painting of interior plumbing systems and components is specified in Section 099123.
 - b. Painting of exterior plumbing systems and components is specified in Section 099113.
 - 10. Provide hangers adjacent to motor-driven equipment with vibration isolation; see Section 220548.
 - 11. Support cast iron drainage piping at every joint.
- U. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.04 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

- D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/4 inch per foot (1:50) slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 330110.58.
- B. Prior to starting work, verify system is complete, flushed, and clean.
- C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
 - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
 - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
 - b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
 - c. Pipe Size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 1/2 inch (13 mm).
 - d. Pipe Size: 4 inches (100 mm) to 6 inches (150 mm):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 5/8 inch (15 mm).

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Water hammer arrestors.

1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping.
- B. Section 224000 - Plumbing Fixtures.

1.03 REFERENCE STANDARDS

- A. ASME A112.6.3 - Floor and Trench Drains; 2019.
- B. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2017.
- C. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- D. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- E. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- D. Certificates: Certify that grease interceptors meet or exceed specified requirements.
- E. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- F. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.
- G. Operation Data: Indicate frequency of treatment required for interceptors.
- H. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- I. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Loose Keys for Outside Hose Bibbs: One.
 - 3. Extra Hose End Vacuum Breakers for Hose Bibbs: One.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

- A. Floor Drains:
 - 1. Manufacturers:
 - a. Sioux Chief; Model 832.
 - b. Substitutions: See Section 016000 - Product Requirements.
- B. Floor Drain (FD-1):
 - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.
 - 2. Square Strainer.
 - 3. Trap Seal Zurn model Z1072.

2.03 CLEANOUTS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
 - 2. Josam Company: www.josam.com/#sle.
 - 3. Zurn Industries, LLC: www.zurn.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Cleanouts at Interior Finished Floor Areas:
 - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- C. Cleanouts at Interior Finished Wall Areas:
 - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.04 HOSE BIBBS

- A. Manufacturers:
 - 1. Murdock Manufacturing, Inc; Model 8120-LF: www.murdockmfg.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Interior Hose Bibbs:

1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.

2.05 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/#sle.
3. Zurn Industries, LLC: www.zurn.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.

1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping.
- B. Section 221006 - Plumbing Piping Specialties.
- C. Section 223000 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

- A. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- B. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
- C. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018.
- D. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- E. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- F. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.
- E. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.02 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for installation of plumbing systems.
- B. Comply with UL (DIR) requirements.
- C. Perform work in accordance with local health department regulations.
- D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.03 FLUSH VALVE WATER CLOSETS [WC-1] - 15 INCHES

- A. Water Closets: Vitreous china, ASME A112.19.2, wall hung, siphon jet flush action, china bolt caps.
 - 1. Bowl: ASME A112.19.2; 14 inches high with elongated rim.
 - 2. Flush Valve: Exposed (top spud).
 - 3. Flush Operation: Sensor operated.
 - 4. Handle Height: 25.5 inches (648 mm) or less.
 - 5. Supply Size: 1-1/2 inches (38 mm).
 - 6. Outlet Size: 2 inches (50 mm).
 - 7. Color: White.
 - 8. Manufacturers:
 - a. American Standard, Inc; Afall Millenium FloWise Model 3351.101:
www.americanstandard-us.com/#sle.
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
 - 1. Sensor-Operated Type: Solenoid operator, battery powered, infrared sensor with mechanical over-ride or over-ride push button.
 - 2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 - 3. Manufacturers:

- a. American Standard, Inc; Model 6065.121.002: www.americanstandard-us.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- C. Seats:
1. Manufacturers:
 - a. American Standard, Inc; Model 5901.100: www.americanstandard-us.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.
- D. Water Closet Carriers:
1. Manufacturers:
 - a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - b. Zurn Industries, LLC: www.zurn.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
 2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.04 FLUSH VALVE WATER CLOSETS [WC-2] - ADA - 17-INCHES

- A. Water Closets: Vitreous china, ASME A112.19.2, wall hung, siphon jet flush action, china bolt caps.
1. Bowl: ASME A112.19.2; 16.5 inches (420 mm) high with elongated rim.
 2. Flush Valve: Exposed (top spud).
 3. Flush Operation: Sensor operated.
 4. Handle Height: 28 inches (711 mm) or less.
 5. Supply Size: 1-1/2 inches (38 mm).
 6. Outlet Size: 2 inches (50 mm).
 7. Color: White.
 8. Manufacturers:
 - a. American Standard, Inc; Afwall Millenium FloWise Model 3351.101: www.americanstandard-us.com/#sle.
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Sensor-Operated Type: Solenoid operator, battery powered, infrared sensor with mechanical over-ride or over-ride push button.
 2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 3. Manufacturers:
 - a. American Standard, Inc; Model 6065.121.002: www.americanstandard-us.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- C. Seats:
1. Manufacturers:
 - a. American Standard, Inc; Model 5901.100: www.americanstandard-us.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.
- D. Water Closet Carriers:
1. Manufacturers:
 - a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - b. Zurn Industries, Inc: www.zurn.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.05 WALL HUNG URINALS [UR-1, UR-2]

- A. Wall Hung Urinal Manufacturers:
 - 1. American Standard, Inc; Washbrook FloWise Model 6590.001: www.americanstandard-us.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
 - 1. Flush Volume: 0.125 gallons (0.47 liters), maximum.
 - 2. Flush Valve: Exposed (top spud).
 - 3. Flush Operation: Sensor operated.
 - 4. Trap: Integral.
- C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
 - 1. Sensor-Operated Type: Solenoid operator, battery powered, infrared sensor with mechanical over-ride or over-ride push button.
 - 2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 - 3. Manufacturers:
 - a. American Standard, Inc; Selectronic 0.125 GPF Model 6063.013.002: www.americanstandard-us.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- D. Carriers:
 - 1. Manufacturers:
 - a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - b. JOSAM Company: www.josam.com/#sle.
 - c. Viega LLC: www.viega.us/#sle.
 - d. Zurn Industries, Inc: www.zurn.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
 - 2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.06 LAVATORIES [LAV-1]

- A. Lavatory Manufacturers:
 - 1. Bradley Corp; Express MG-2: www.bradleycorp.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Wall Hung Lavatory System: ASME A112.19.2; vitreous china wall hung lavatory, 54 by 22 inch (1372 by 559 mm) minimum, with 4 inch (100 mm) high back, rectangular basin with splash lip, front overflow, and soap depression.
- C. Terron and TerronRE are NAHV certified to meet ANSI Z124.3, Z124.6 and ANSI/ICPA SS-1. Reliable Plug-in, Battery or infrared activation. ADA and TAS compliant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.

- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

3.08 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
 - 1. Water Closet:
 - a. Standard: 15 inches (380 mm) to top of bowl rim.
 - b. Accessible: 18 inches (455 mm) to top of seat.
 - 2. Water Closet Flush Valves:
 - a. Standard: 11 inches (280 mm) min. above bowl rim.
 - b. Recessed: 10 inches (255 mm) min. above bowl rim.
 - 3. Urinal:
 - a. Standard: 22 inches (560 mm) to top of bowl rim.

- b. Accessible: 17 inches (430 mm) to top of bowl rim.
- 4. Lavatory:
 - a. Standard: 31 inches (785 mm) to top of basin rim.
 - b. Accessible: 34 inches (865 mm) to top of basin rim.
- 5. Drinking Fountain:
 - a. Child: 30 inches (760 mm) to top of basin rim.
 - b. Standard Adult: 40 inches (1015 mm) to top of basin rim.
 - c. Accessible: 36 inches (915 mm) to top of spout.

END OF SECTION

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 National 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 of Corrosion Engineers
26.	ASSE	American Society of Sanitary Engineers
27.	International Building Code	
28.	International Fire Code	
29.	International Existing Building Code	
30.	International Fuel Gas Code	
31.	International Plumbing Code	
32.	International Energy Conservation Code	
33.	International Mechanical Code	
34.	New York State Industrial Code Rules	
35.	IRI	Industrial Risk Insurers
36.	AGA	American Gas Association
37.	AABC	American Air Balance Council
38.	NEBB	National Environmental Balancing Bureau
39.	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 not 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)
Chillers	16 hrs.
Cooling Towers	16 hrs.
Roof Top Units	8 hrs.
Air Handlers	8 hrs.
Boilers and Burners	16 hrs
DDC Control System	24 hrs.
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

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. BOCA Building Code
- B. NFPA Fire Code
- C. ANSI A10.6 - Safety Requirements for Demolition
- D. National Association of Demolition Contractors (NADC) - Demolition Safety Manual
- E. NFPA 51B - Cutting and Welding Processes
- F. NFPA 70 - National Electrical Code
- G. NFPA 241 - Safeguarding Building Construction and Demolition Operations
- H. OSHA 29 CRF 1910 - Occupational Safety and Health Standards
- I. 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 contaminants 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) -20°F to 200°F. 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 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 SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports- Selection and Application
- G. 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. Uninsulated pipes 2 inch and smaller:
 - a. Adjustable steel swivel ring (band type) hanger, B-Line B3170.
 - b. Adjustable steel swivel J-hanger, B-Line B3690.
 - c. Malleable iron ring hanger, B-Line B3198R or hinged ring hanger, B3198H.
 - d. Malleable iron split-ring hanger with eye socket, B-Line B3173 with B3222.
 - e. Adjustable steel clevis hanger, B-Line B3104 or B3100.
2. Uninsulated pipes 2-1/2 inch and larger:
 - a. Adjustable steel clevis hanger, B-Line B3100.
 - b. Pipe roll with sockets, B-Line B3114.
 - c. Adjustable steel yoke pipe roll, B-Line B3110.
3. 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.
4. Insulated pipe- Cold or chilled water piping:
 - a. 5 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield. B-Line B3100 with B3151 series.
 - b. 6 inch and larger pipes:
 - 1) Pipe roll with sockets with pipe covering protection saddle, B-Line B3114 with B3160-B3165 series.
 - 2) Adjustable steel yoke pipe roll with pipe covering protection saddle. B-Line B3110 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. Floor Supports
- 1. Hot piping under 6 inch and all cold piping:
 - a. Carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. B-Line B3093 and B3088T or B3090 and B3088. Screw or weld pipe saddle to appropriate base stand.
 - 2. Hot piping 6 inch and larger:
 - a. Adjustable Roller stand with base plate, B-Line B3117SL
 - b. Adjustable roller support and steel support sized for elevation, B-Line B3124
- F. 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.
- G. Plastic Pipe Supports
- 1. V-Bottom clevis hanger with galvanized 18-gauge continuous support channel, B-Line B3106 and B3106V, to form a continuous support system for plastic pipe or flexible tubing.
 - 2. Supplementary Structural Supports
 - a. Design and fabricate supports using structural quality steel bolted framing materials as manufactured by Cooper B-Line. Provide roll formed channels, 12 gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch by 1-5/8 inch or greater as required by loading conditions. Submit designs for pipe tunnels, pipe galleries, etc., to Architect/Engineer for approval. Use clamps and fittings designed for use with the strut system.
- H. 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 $\frac{3}{4}$ 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 $\frac{3}{4}$ 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 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.

2.06 DUCT WORK IDENTIFICATION

- A. Provide full air distribution system identification at each side of a wall penetration, in a mechanical room, at all changes in direction and at no more than 50 foot intervals. Provide arrows identifying direction of flow.
- B. Fire damper or Smoke damper access points shall be permanently identified on the exterior by a label having letters not less than 0.5 inch in height reading: SMOKE DAMPER or FIRE DAMPER.
- C. Identification shall be preprinted labels.

- D. Letter Size: 1-1/2 inches in height.

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 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. 2015 International Energy Conservation Code
- D. 2015 International Mechanical Code
- E. Underwriters Laboratories, Inc. (UL):
 - 1. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
- F. 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 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 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 HIGH DENSITY JACKETED INSULATION INSERTS FOR HANGERS AND SUPPORTS

- A. For use with Fiberglass Insulation:
1. Cold Service Piping:
 - a. Polyurethane Foam: Minimum density 4 pcf, K of 0.13 at 75 degrees F, minimum compressive strength of 125 psi.
 2. Hot Service Piping:
 - a. Calcium Silicate: Minimum density 15 pcf, K of 0.50 at 300 degrees F; ASTM C 533.
 - b. Perlite: Minimum density 12 pcf, K of 0.60 at 300 degrees F; ASTM C 610.
- B. For Use with Flexible Elastomeric Foam Insulation: Hardwood dowels and blocks, length or thickness equal to insulation thickness, other dimensions as specified or required.

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.

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 1/2-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 as 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 PIPING INSULATION MATERIAL SCHEDULE

SYSTEM OR SERVICE	LOCATION	INSULATION TYPE	JACKET
HEATING HOT WATER	INSIDE	FIBER GLASS	ALL SERVICE JACKET
HEATING HOT WATER	INSIDE	FIBER GLASS	ALL SERVICE JACKET
HEATING HOT WATER	OUTSIDE	FIBER GLASS	ALUMINUM JACKET
HEATING HOT WATER	OUTSIDE	FIBER GLASS	ALUMINUM JACKET
CHILLED WATER	INSIDE	CELLULAR GLASS	ALL SERVICE JACKET
CHILLED WATER	INSIDE	CELLULAR GLASS	ALL SERVICE JACKET
CHILLED WATER	OUTSIDE	CELLULAR GLASS	ALUMINUM JACKET
CHILLED WATER	OUTSIDE	CELLULAR GLASS	ALUMINUM 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 (LPS) TO 15 PSIG.	INSIDE	FIBER GLASS	ALL SERVICE JACKET
STEAM CONDENSATE	INSIDE	FIBER GLASS	ALL SERVICE JACKET
STEAM CONDENSATE	INSIDE	FIBER GLASS	ALL SERVICE JACKET
STEAM CONDENSATE	OUTSIDE	FIBER GLASS	ALUMINUM JACKET
STEAM CONDENSATE	OUTSIDE	FIBER GLASS	ALUMINUM JACKET
DOMESTIC COLD WATER	INSIDE	FIBER GLASS	ALL SERVICE JACKET
DOMESTIC HOT WATER	INSIDE	FIBER GLASS	ALL SERVICE JACKET

3.05 MINIMUM PIPING INSULATION THICKNESS (IN.)

FLUID OPERATING TEMP RANGE (°F)	SYSTEMS IN TEMP RANGE	INSULATION 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. 2015 International Energy Conservation Code
- D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
- E. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- F. Underwriters Laboratories, Inc. (UL):
 - 1. UL 723 - Surface Burning Characteristics of Building Materials.
- G. 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 250° 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 450° 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 Hydroshield[®] 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 FIRE RATED BLANKET (KITCHEN HOOD EXHAUST DUCT)

- A. Thermal Material: 2192°F rated core blanket, manufactured from calcium magnesium silicate.
- B. Fully encapsulated thermal material in fiberglass reinforced aluminum/polypropylene scrip (FSP).
 - 1. Encapsulation FSP marked with UL Classification Mark.
 - 2. Encapsulation FSP marked with ICC-ES report number ESR 2213.
 - 3. Collars supplied in 6 inch wide by 25 feet long rolls.
- C. Product Characteristics:
 - 1. Thickness: 1-1/2 inch.
 - 2. Nominal Density: 6 pcf.

3. R-Value: 7.35 per layer when tested in accordance with ASTM C 518 at 75°F.
4. Flame Spread: <25 when tested in accordance with ASTM E 84.
5. Smoke Spread: <50 when tested in accordance with ASTM E 84.

D. Approved Products:

1. FireMaster FastWrap XL by Thermal Ceramics.

2.07 FIRE RATED BLANKET INSULATION ACCESSORIES

- A. Glass Filament Tape: Minimum $\frac{3}{4}$ inch wide - used to temporarily secure blanket until permanent attachment using steel banding and/or steel insulation pins.
- B. Aluminum Foil Tape: Minimum 3 inches used to seal cut edges.
- C. Carbon Steel or Stainless Strapping Material Minimum: $\frac{1}{2}$ inch wide and 0.015 inch thick.
- D. Steel Insulation Pins: Minimum 12 gage, length sufficient to penetrate through duct wrap insulation.
- E. Insulation Clips: Galvanized steel, minimum 1-1/2 inches round or square.
- F. Through Penetration Firestop Sealants:
 1. Packing Material: Remove encapsulation material from wrap, use core blanket (white) as penetration packing material.
 2. Firestop sealants per applicable building code report and/or laboratory design listings.
- G. Grease and HVAC Duct Access Doors:
 1. Thermal Ceramics FastDoor XL Access doors

2.08 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 25% 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 FIRE RATED BLANKET

- A. Install insulation in direct contact with the ductwork in accordance with the manufacturer's instructions and referenced standards.
- B. Install 2 layers of FireMaster FastWrap XL for zero clearance and a 1 and 2 hour commercial kitchen grease duct application per ASTM E 2336.
 1. Consult with manufacturer of proposed substitutions for required thickness to maintain a 2-hr fire rating with a zero clearance to combustibles.
- C. Install 1 layer of FireMaster FastWrap XL for a 1 and 2 hour air ventilation duct enclosure per ISO 6944-1985.
- D. Where exhaust duct penetrates firewall install ductwrap as per the manufacturer's instructions for through penetrations.
- E. Locate doors on 20-foot centers on straight runs of ductwork and at each change of direction. Position doors on the side of duct a minimum of 1.5 inches above the bottom of the duct.

3.09 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 RELATED DOCUMENTS

- A. All work of this Division shall be coordinated and provided by the single Building Management System (BMS) Contractor.
- B. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the Division 23 Sections for details.
- C. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.
- D. If the BMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

1.02 BMS DESCRIPTION

- A. The Building Management System (BMS) shall be a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner's IT staff to ensure that the BMS will perform in the owner's environment without disruption to any of the other activities taking place on that LAN.
- B. All points of user interface shall be on standard PCs that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser.
- C. Servers shall be used for the purpose of providing a location for extensive archiving of system configuration data, and historical data such as trend data and operator transactions. All data stored will be through the use of a standard data base platform: Microsoft SQL Server Express or Microsoft SQL Server as dictated elsewhere in this specification.
- D. The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specification together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.
- E. The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.
- F. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.
- G. The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:
 - 1. Operator information, alarm management and control functions.

2. Enterprise-level information and control access.
3. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
4. Diagnostic monitoring and reporting of BMS functions.
5. Offsite monitoring and management access.
6. Energy management
7. Standard applications for terminal HVAC systems.
8. BACnet integration to the Variable Refrigerant Flow Equipment

1.03 QUALITY ASSURANCE

A. General

1. The Building Management System Contractor shall be a manufacturer-owned branch office of a recognized national manufacturer that is regularly engaged in the engineering, programming, installation and service of total integrated Building Management Systems.
2. The BMS Contractor shall be:
 - a. EMF, Energy Management of Facilities, Inc. (Partner of Schneider Electric)
 - 1) Address: 581 N State Road, Briarcliff Manor, NY 10510
 - 2) Phone: (914) 747-1007
 - 3) Website: www.emfcontrols.com
3. Quality Management Program
 - a. Designate a competent and experienced employee to provide BMS Project Management. The designated Project Manger shall be empowered to make technical, scheduling and related decisions on behalf of the BMS Contractor. At minimum, the Project Manager shall:
 - 1) Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
 - 2) Manage the financial aspects of the BMS Contract.
 - 3) Coordinate as necessary with other trades.
 - 4) Be responsible for the work and actions of the BMS workforce on site.

1.04 WORK BY OTHERS

- A. The demarcation of work and responsibilities between the BMS Contractor and other related trades shall be as outlined in the BMS RESPONSIBILITY MATRIX:

WORK	FURNISH	INSTALL	LOW VOLT. WIRING/TUBE	LINE POWER
BMS low voltage wiring	BMS	BMS	BMS	N/A
BMS communications bus wiring	BMS	BMS	BMS	N/A
BMS conduits and raceway	BMS	BMS	BMS	BMS
Automatic dampers	BMS	HVAC Contractor	N/A	N/A
Automatic valves	HVAC Contractor	HVAC Contractor	BMS	N/A
Pipe insertion devices and taps including thermowells, flow and pressure stations	BMS	HVAC Contractor	BMS	BMS
BMS Current Switches	BMS	BMS	BMS	N/A
BMS Control Relays	BMS	BMS	BMS	N/A
All BMS Nodes, equipment, housings, enclosures and panels	BMS	BMS	BMS	Electrical Contractor
Packaged RTU Network Thermostats	BMS	BMS	BMS	Electrical Contractor

WORK	FURNISH	INSTALL	LOW VOLT. WIRING/TUBE	LINE POWER
Packaged RTU factory-mounted controls	HVAC Contractor	HVAC Contractor	HVAC Contractor	Electrical Contractor

1.05 SUBMITTALS

- A. Shop Drawings, Product Data, and Samples
 - 1. The BMS contractor shall submit a list of all shop drawings with submittals dates within 30 days of contract award.
 - 2. Submittals shall be in defined packages. Each package shall be complete and shall only reference itself and previously submitted packages. The packages shall be as approved by the Architect and Engineer for Contract compliance.
 - 3. Allow 15 working days for the review of each package by the Architect and Engineer in the scheduling of the total BMS work.
 - 4. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the BMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.
 - 5. Prepare an index of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.
 - 6. The BMS Contractor shall correct any errors or omissions noted in the first review.
 - 7. At a minimum, submit the following:
 - a. BMS network architecture diagrams including all nodes and interconnections.
 - b. Systems schematics, sequences and flow diagrams.
 - c. Points schedule for each point in the BMS, including: Point Type, Object Name, Expanded ID, Display Units, Controller type, and Address.
 - d. Samples of Graphic Display screen types and associated menus.
 - e. Detailed Bill of Material list for each system or application, identifying quantities, part numbers, descriptions, and optional features.
 - f. Control Damper Schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Duct Size, Damper Size, Mounting, and Actuator Type.
 - g. Details of all BMS interfaces and connections to the work of other trades.
 - h. Product data sheets or marked catalog pages including part number, photo and description for all products including software.

1.06 RECORD DOCUMENTATION

- A. Operation and Maintenance Manuals
 - 1. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media, and include the following for the BMS provided:
 - a. Table of contents.
 - b. As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
 - c. Manufacturer's product data sheets or catalog pages for all products including software.
 - d. System Operator's manuals.
 - e. Archive copy of all site-specific databases and sequences.

- f. BMS network diagrams.
 - g. Interfaces to all third-party products and work by other trades.
 - h. The Operation and Maintenance Manual CD shall be self-contained, and include all necessary software required to access the product data sheets. A logically organized table of contents shall provide dynamic links to view and print all product data sheets. Viewer software shall provide the ability to display, zoom, and search all documents.
2. On-Line documentation: After completion of all tests and adjustments the contractor shall provide a copy of all as-built information and product data to be installed on a customer designated computer workstation or server

1.07 WARRANTY

- A. Standard Material and Labor Warranty:
1. Provide a one-year labor and material warranty on the BMS.
 2. If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the BMS Contractor at the cost of the BMS Contractor.
 3. Maintain an adequate supply of materials within 100 miles of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during BMS Contractor's normal business hours.

PART 2 - PRODUCTS

2.01 LARGE GENERAL DESCRIPTION

- A. The Building Management System (BMS) shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third-party devices and applications. The system shall be designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.
- B. The Building Management System shall be Metasys Extended Architecture and shall consist of the following:
1. Standalone Network Automation Engine(s)
 2. Field Equipment Controller(s)
 3. Input/Output Module(s)
 4. Local Display Device(s)
 5. Distributed User Interface(s)
 6. Network processing, data storage and communications equipment
 7. Other components required for a complete and working BMS
 8. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.
 9. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.
 - a. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
 - b. The System shall maintain all settings and overrides through a system reboot.
 10. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.
 11. Acceptable Manufacturers
 - a. EMF, Energy Management of Facilities, Inc. (Partner of Schneider Electric)

2.02 BMS ARCHITECTURE

A. Automation Network

1. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard "off the shelf" products available through normal PC vendor channels.
2. The BMS shall network multiple user interface clients, automation engines, system controllers and application-specific controllers. Provide one (1) application and data system server for long term data storage that also permits up to five (5) simultaneous system users.
3. All BMS devices on the automation network shall be capable of operating at a communication speed of 100 Mbps, with full peer-to-peer network communication.
4. Network Automation Engines (NAE) and Network Control Engines (NCE) shall reside on the automation network.
5. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

B. Control Network

1. Network Automation Engines (NAE) and Network Control Engines (NCE) shall provide supervisory control over the control network and shall be capable of supporting both of the following communication protocols as required:
 - a. BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9
 - b. LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).
2. The Network Engines shall be BACnet Testing Labs (BTL) certified and carry the BTL Label. The NAE shall be tested and certified as a BACnet Building Controller (B-BC).
3. Control networks shall provide either "Peer-to-Peer," Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.
4. DDC Controllers shall reside on the control network.
5. Control network communication protocol shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135. LonWorks is only acceptable for third party integration where the third party device is unable to communicate using BACnet protocol.
6. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.
7. The PICS shall be submitted prior to contract award, when requested, as a condition of award. Otherwise, they shall be part of the project submittal package.

C. Integration

1. BACnet Protocol Integration - BACnet
 - a. The neutral protocol used between systems shall be either BACnet over Ethernet and comply with the ASHRAE BACnet standard 135-2008 or BACnet MS/TP communicating at 38,400 baud.
 - b. A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.
 - c. The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

2.03 USER INTERFACE

A. Dedicated Web Based User Interface

1. The BMS Contractor shall provide and install on the maintenance manager's personal computer the ability for command entry, information management, network alarm management, and database management functions for the BMS. All real-time control

- functions, including scheduling, history collection and alarming, shall be resident in the BMS Network Automation Engines to facilitate greater fault tolerance and reliability.
2. Dedicated User Interface Architecture - The architecture of the computer shall be implemented to conform to industry standards, so that it can accommodate applications provided by the BMS Contractor and by other third party applications suppliers, including but not limited to Microsoft Office Applications. Specifically it must be implemented to conform to the following interface standards.
 - a. Microsoft Internet Explorer for user interface functions
 - b. Microsoft Office Professional for creation, modification and maintenance of reports, sequences other necessary building management functions
 - c. Microsoft Outlook or other e-mail program for supplemental alarm functionality and communication of system events, and reports
 - d. Required network operating system for exchange of data and network functions such as printing of reports, trends and specific system summaries
 3. Peripheral Hardware
 - a. Reports printer:
 - 1) Printer Make - Hewlett Packard DeskJet
 - 2) Print Speed - 600 DPI Black, 300 DPI Color
 - 3) Buffer - 64 K Input Print Buffer
 - 4) Color Printing - Include Color Kit
- B. Distributed Web Based User Interface
1. All features and functions of the dedicated user interface previously defined in this document shall be available on any computer connected directly or via a wide area or virtual private network (WAN/VPN) to the automation network and conforming to the following specifications.
 2. The software shall run on the Microsoft Internet Explorer (7.0 or higher) browser supporting the following functions:
 - a. Configuration
 - b. Commissioning
 - c. Data Archiving
 - d. Monitoring
 - e. Commanding
 - f. System Diagnostics
 3. Minimum hardware requirements:
 - a. 1GB RAM
 - b. 2.0 GHz Clock Speed Pentium 4 Microprocessor
 - c. 100 GB Hard Drive.
 - d. 1 Keyboard with 83 keys (minimum).
 - e. SVGA 1024x768 resolution display with 64K colors and 16 bit color depth
 - f. Mouse or other pointing device
- C. Site Management User Interface Application Components
1. Operator Interface
 - a. An integrated browser based client application shall be used as the user operator interface program.
 - b. The System shall employ an event-driven rather than a device polling methodology to dynamically capture and present new data to the user.
 - c. All Inputs, Outputs, Setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.
 - d. The user interface software shall provide help menus and instructions for each operation and/or application.
 - e. The system shall support customization of the UI configuration and a home page display for each operator.

- f. The system shall support user preferences in the following screen presentations:
 - 1) Alarm
 - 2) Trend
 - 3) Display
 - 4) Applications
 - g. All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.
 - h. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:
 - 1) User access for selective information retrieval and control command execution
 - 2) Monitoring and reporting
 - 3) Alarm, non-normal, and return to normal condition annunciation
 - 4) Selective operator override and other control actions
 - 5) Information archiving, manipulation, formatting, display and reporting
 - 6) BMS internal performance supervision and diagnostics
 - 7) On-line access to user HELP menus
 - 8) On-line access to current BMS as-built records and documentation
 - 9) Means for the controlled re-programming, re-configuration of BMS operation and for the manipulation of BMS database information in compliance with the prevailing codes, approvals and regulations for individual BMS applications
 - i. The system shall support a list of application programs configured by the users that are called up by the following means:
 - 1) The Tools Menu
 - 2) Hyperlinks within the graphics displays
 - 3) Key sequences
 - j. The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.
2. Navigation Trees
- a. The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the networks.
 - b. Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.
 - c. The navigation trees shall be “dockable” to other displays in the user interface such as graphics. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar. A simple keystroke will reattach the navigation to the primary display of the user interface.
3. Alarms
- a. Alarms shall be routed directly from Network Automation Engines to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:
 - 1) Log date and time of alarm occurrence.
 - 2) Generate a “Pop-Up” window, with audible alarm, informing a user that an alarm has been received.
 - 3) Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.
 - 4) Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include

- the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
- 5) Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.
 - 6) Any attribute of any object in the system may be designated to report an alarm.
- b. The BMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions.
 - c. The BMS shall allow a minimum of 4 categories of alarm sounds customizable through user defined wav.files.
 - d. The BMS shall annunciate application alarms at minimum, as required by Part 3.
4. Reports and Summaries
- a. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:
 - 1) All points in the BMS
 - 2) All points in each BMS application
 - 3) All points in a specific controller
 - 4) All points in a user-defined group of points
 - 5) All points currently in alarm
 - 6) All points locked out
 - 7) All user defined and adjustable variables, schedules, interlocks and the like.
 - b. Summaries and Reports shall be accessible via standard UI functions and not dependent upon custom programming or user defined HTML pages.
 - c. Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.
 - d. Provide the capability to view, command and modify large quantities of similar data in tailored summaries created online without the use of a secondary application like a spreadsheet. Summary definition shall allow up to seven user defined columns describing attributes to be displayed including custom column labels. Up to 100 rows per summary shall be supported. Summary viewing shall be available over the network using a standard Web browser.
5. Schedules
- a. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:
 - 1) Weekly schedules
 - 2) Exception Schedules
 - 3) Monthly calendars
 - b. Weekly schedules shall be provided for each group of equipment with a specific time use schedule.
 - c. It shall be possible to define one or more exception schedules for each schedule including references to calendars
 - d. Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.
 - e. Changes to schedules made from the User Interface shall directly modify the Network Automation Engine schedule database.
 - f. Schedules and Calendars shall comply with ASHRAE SP135/2008 BACnet Standard.
 - g. Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.

- h. Software shall be provided to configure and implement optimal start and stop programming based on existing indoor and outdoor environmental conditions as well as equipment operating history
- 6. Password
 - a. Multiple-level password access protection shall be provided to allow the user/manager to user interface control, display, and database manipulation capabilities deemed appropriate for each user, based on an assigned password.
 - b. Each user shall have the following: a user name (accept 24 characters minimum), a password (accept 12 characters minimum), and access levels.
 - c. The system shall allow each user to change his or her password at will.
 - d. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.
 - e. A minimum of six levels of access shall be supported individually or in any combination as follows:
 - 1) Level 1 = View Data
 - 2) Level 2 = Command
 - 3) Level 3 = Operator Overrides
 - 4) Level 4 = Database Modification
 - 5) Level 5 = Database Configuration
 - 6) Level 6 = All privileges, including Password Add/Modify
 - f. A minimum of 100 unique passwords shall be supported.
 - g. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.
 - h. Operators shall be further limited to only access, command, and modify those buildings, systems, and subsystems for which they have responsibility. Provide a minimum of 100 categories of systems to which individual operators may be assigned.
 - i. The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.
- 7. Screen Manager
 - a. The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.
- 8. Dynamic Color Graphics
 - a. The graphics application program shall be supplied as an integral part of the User Interface. Browser or Workstation applications that rely only upon HTML pages shall not be acceptable.
 - b. The graphics applications shall include a create/edit function and a runtime function. The system architecture shall support an unlimited number of graphics documents (graphic definition files) to be generated and executed.
 - 1) The graphics shall be able to display and provide animation based on real-time data that is acquired, derived, or entered.
 - c. Graphics runtime functions - A maximum of 16 graphic applications shall be able to execute at any one time on a user interface or workstation with 4 visible to the user. Each graphic application shall be capable of the following functions:
 - 1) All graphics shall be fully scalable
 - 2) The graphics shall support a maintained aspect ratio.
 - 3) Multiple fonts shall be supported.
 - 4) Unique background shall be assignable on a per graphic basis.
 - 5) The color of all animations and values on displays shall indicate the status of the object attribute.

- 6) Graphics that represent buildings or systems shall allow natural links and transitions between related detailed tabular views of data that compliment the graphic.
 - d. Operation from graphics - It shall be possible to change values (setpoints) and states in system controlled equipment directly from the graphic.
 - e. Floor Plan graphics - The user interface shall provide graphic applications that summarize conditions on a floor. Floor plan graphics shall indicate thermal comfort using dynamic colors to represent zone temperature deviations from zone setpoint(s). Floor plan graphics shall display overall metrics for each zone in the floor.
 - f. Aliasing - Many graphic displays representing part of a building and various building components are exact duplicates, with the exception that the various variables are bound to different field values. Consequently, it shall be possible to bind the value of a graphic display to aliases, as opposed to the physical field tags.
 - g. Graphic editing tool - A graphic editing tool shall be provided that allows for the creation and editing of graphic files. The graphic editor shall be capable of performing/defining all animations, and defining all runtime binding.
 - 1) The graphic editing tool shall provide a library of standard HVAC equipment, floor plan, lighting, security and network symbols.
 - 2) The graphic editing tool shall provide for the creation and positioning of library symbols by dragging from tool bars or drop-downs and positioning where required.
 - 3) The graphics editing tool shall permit the importing of AutoCAD drawings for use in the system.
 - 4) The graphic editing tool shall be able to add additional content to any graphic by importing images in the SVG, PNG or JPG file formats.
9. Historical trending and data collection
- a. Each Automation Engine shall store trend and point history data for all analog and digital inputs and outputs, as follows:
 - 1) Any point, physical or calculated, may be designated for trending. Two methods of collection shall be allowed:
 - (a) Defined time interval
 - (b) Upon a change of value
 - (c) Each Automation Engine shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.
 - b. Trend and change of value data shall be stored within the engine and uploaded to a dedicated trend database or exported in a selectable data format via a provided data export utility. Uploads to a dedicated database shall occur based upon one of the following: user-defined interval, manual command, or when the trend buffers are full. Exports shall be as requested by the user or on a time scheduled basis.
10. Trend data viewing and analysis
- a. Provide a trend viewing utility that shall have access to all database points.
 - b. It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.
 - c. The trend viewing utility shall have the capability to define trend study displays to include multiple trends
 - d. Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as ranging, color, and plot style.
 - e. Display magnitude and units shall both be selectable by the operator at any time without reconfiguring the processing or collection of data. This is a zoom capability.
 - f. Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.
 - g. The Display shall support the user's ability to change colors, sample sizes, and types of markers.

11. Database Management
 - a. Where a separate SQL database is utilized for information storage the System shall provide a Database Manager that separates the database monitoring and managing functions by supporting two separate windows.
 - b. Database secure access shall be accomplished using standard SQL authentication including the ability to access data for use outside of the Building Automation application.
 - c. The database managing function shall include summarized information on trend, alarm, event, and audit for the following database management actions:
 - 1) Backup
 - 2) Purge
 - 3) Restore
 - d. The Database Manager shall support four tabs:
 - 1) Statistics - shall display Database Server information and Trend, Alarm (Event), and Audit information on the Metasys Databases.
 - 2) Maintenance - shall provide an easy method of purging records from the Metasys Server trend, alarm (event), and audit databases by supporting separate screens for creating a backup prior to purging, selecting the database, and allowing for the retention of a selected number of day's data.
 - 3) Backup - Shall provide the means to create a database backup file and select a storage location.
 - 4) Restore - shall provide a restricted means of restoring a database by requiring the user to log into an Expert Mode in order to view the Restore screen.
 - e. The Status Bar shall appear at the bottom of all Metasys Database Manager Tabs and shall provide information on the current database activity. The following icons shall be provided:
 - 1) Ready
 - 2) Purging Record from a database
 - 3) Action Failed
 - 4) Refreshing Statistics
 - 5) Restoring database
 - 6) Shrinking a database
 - 7) Backing up a database
 - 8) Resetting internet information Services
 - 9) Starting the Metasys Device Manager
 - 10) Shutting down the Metasys Device Manager
 - 11) Action successful
 - f. The Database Manager monitoring functions shall be accessed through the Monitoring Settings window and shall continuously read database information once the user has logged in.
 - g. The System shall provide user notification via taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.
 - h. The Monitoring Settings window shall have the following sections:
 - 1) General - Shall allow the user to set and review scan intervals and start times.
 - 2) Email - Shall allow the user to create and review e-mail and phone text messages to be delivered when a Warning or Alarm is generated.
 - 3) Warning - shall allow the user to define the Warning limit parameters, set the Reminder Frequency, and link the e-mail message.
 - 4) Alarm - shall allow the user to define the Alarm limit parameters, set the Reminder Frequency, and link the e-mail message.
 - 5) Database login - Shall protect the system from unauthorized database manipulation by creating a Read Access and a Write Access for each of the Trend, Alarm (Event) and Audit databases as well as an Expert Mode required to restore a database.
 - i. The Monitoring Settings Taskbar shall provide the following informational icons:

- 1) Normal - Indicates by color and size that all databases are within their limits.
 - 2) Warning - Indicates by color and size that one or more databases have exceeded their Warning limit.
 - 3) Alarm - Indicates by color and size that one or more databases have exceeded their Alarm limit.
- j. The System shall provide user notification via Taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.

2.04 NETWORK AUTOMATION ENGINES (NAE)

- A. The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Engines.
- B. Automation network - The NAE shall reside on the automation network and shall support a subnet of system controllers.
- C. User Interface - Each NAE shall have the ability to deliver a web based User Interface (UI) as previously described. All computers connected physically or virtually to the automation network shall have access to the web based UI.
- D. The web based UI software shall be imbedded in the NAE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.
- E. Network Automation Engines supporting 100 or fewer field controllers shall support a minimum of two (2) concurrent users. Network Engines with multiple field buses or supporting more than 100 field controllers shall support a minimum of four (4) concurrent users.
- F. The web based user shall have the capability to access all system data through one NAE.
- G. Remote users connected to the network through an Internet Service Provider (ISP) or telephone dial up shall also have total system access through one NAE.
- H. Systems that require the user to address more than one NAE to access all system information are not acceptable.
- I. The NAE shall have the capability of generating web based UI graphics. The graphics capability shall be imbedded in the NAE.
- J. Systems that support UI Graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.
- K. The web based UI shall support the following functions using a standard version of Microsoft Internet Explorer:
 1. Configuration
 2. Commissioning
 3. Data Archiving
 4. Monitoring
 5. Commanding
 6. System Diagnostics
 - a. Systems that require workstation software or modified web browsers are not acceptable.
 - b. The NAE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.

- c. Processor - The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.
 - d. Memory - Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
 - e. Hardware Real Time Clock - The NAE shall include an integrated, hardware-Based, real-time clock.
 - f. Communications Ports - Network Automation Engines supporting 100 or fewer field controllers shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
 - 1) USB port
 - 2) URS-232 serial data communication port
 - 3) RS-485 port
 - 4) Ethernet port
7. Network Automation Engines with multiple field buses or supporting more than 100 field controllers shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
 - a. Two (2) USB port
 - b. Two (2) URS-232 serial data communication port
 - c. Two (2) RS-485 port
 - d. One (1) Ethernet port
 8. Diagnostics - The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
 9. Power Failure - In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.
 10. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
 11. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
 12. Certification - The NAE shall be listed by Underwriters Laboratories (UL).

2.05 NETWORK CONTROL ENGINE (NCE)

- A. The Network Control Engine (NCE) shall meet all of the programming, supervisory and communications requirements of the Network Automation Engine described above plus provide the additional features and capabilities described below.
- B. The Network Control Engine (NCE) shall be a fully user-programmable, digital controller that includes a minimum of 33 I/O points. It shall reside on the automation network and shall support a subnet of 32 Field Controllers
- C. User Interface - Each NCE shall have the ability to deliver a web based User Interface (UI) as previously described for Network Automation Engines.
- D. The NCE shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state

based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals as well as four (4) hours per controller per warranty year per controller to re-tune loops according to current system conditions. This time shall be equally divided between the change from heating season to cooling season and back to heating season.

- E. The NCE shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.
- F. The NCE shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
- G. The NCE shall support the following number and types of inputs and outputs:
 - 1. Ten Universal Inputs - shall be configured to monitor any of the following:
 - a. Analog Input, Voltage Mode
 - b. Analog Input, Current Mode
 - c. Analog Input, Resistive Mode
 - d. Binary Input, Dry Contact Maintained Mode
 - e. Binary Input, Pulse Counter Mode
 - f. Eight Binary Inputs - shall be configured to monitor either of the following:
 - g. Dry Contact Maintained Mode
 - h. Pulse Counter Mode
 - 2. Four Analog Outputs - shall be configured to output either of the following
 - a. Analog Output, Voltage Mode
 - b. Analog Output, Current Mode
 - 3. Seven Binary Outputs - shall output the following:
 - a. 24 VAC Triac
 - 4. Four Configurable Outputs - shall be configured to output either of the following:
 - a. Analog Output, Voltage Mode
 - b. Binary Output, 24 VAC Triac Mode
 - 5. The NCE shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus). The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
 - 6. The NCE shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the Field Trunk or the SA Bus.
 - 7. All Network Control Engines shall be provided with a panel mountable Local Controller Display either as an integral part of the NCE or as a remote device communicating over the SA Bus.
 - 8. The Display shall use a BACnet Standard SSPC-135, clause 9 Master-Slave/Token-Passing protocol and shall allow the user to view monitored points without logging into the system.
 - 9. The Display shall provide password protection with User adjustable password time-out. It shall also allow the user to view and change setpoints, modes of operation, and parameters.
 - 10. The Display shall be menu driven with separate paths for:
 - a. Input/Output
 - b. Parameter/Setpoint
 - c. Overrides
 - 11. The Display shall use easy-to-read English text messages and shall allow the user to select the points to be shown and in what order.
 - 12. The Display shall support a back lit Liquid Crystal Display (LCD) with adjustable contrast and brightens and automatic backlight brightening during user interaction.

13. The display shall be a minimum of 4 lines and a minimum of 20 characters per line
14. The NCE shall be microprocessor-based with a minimum word size of 32 bits. The processor shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NCE size and capability shall be sufficient to fully meet the requirements of this Specification.
15. Each NCE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
16. The NCE shall employ nonvolatile Flash memory to store all programs and data. The NCE shall employ a data protection battery to save data and power the real time clock when primary power is interrupted.
17. Communications Ports - The NCE shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
 - a. USB port
 - b. RS-232 serial data communication port
 - c. RS-485 port
 - d. RJ-45 Ethernet port
 - e. RJ-12 jack
 - f. The NCE shall support an optional internal modem with RJ-12 6-pin telephone line connector.
18. Diagnostics - The NCE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Control Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
19. Power Failure - In the event of the loss of normal power, The NCE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.
20. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
21. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
22. Field Controller Bus - The NCE shall support the same communication protocols as described for the Network Engines.

2.06 DDC SYSTEM CONTROLLERS

- A. Field Equipment Controller (FEC)
 1. The Field Equipment Controller (FEC) shall be a fully user-programmable, digital controller that supports and communicates via BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network. It shall be BACnet Testing Labs (BTL) certified as a BACnet Application Specific Controller (B-ASC) and carry the BTL Label.
 2. The FEC shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals as well as four (4) hours per warranty year per controller to re-tune loops according to current system conditions. This time shall be equally divided between the change from heating season to cooling season and back to heating season
 3. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.

4. The FEC shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB. It shall include troubleshooting LED indicators.
5. The FEC shall support the following types of direct wired inputs and outputs:
 - a. Universal Inputs - shall be configured to monitor any of the following:
 - 1) Analog Input, Voltage Mode
 - 2) Analog Input, Current Mode
 - 3) Analog Input, Resistive Mode
 - 4) Binary Input, Dry Contact Maintained Mode
 - 5) Binary Input, Pulse Counter Mode
 - b. Binary Inputs - shall be configured to monitor either of the following:
 - 1) Dry Contact Maintained Mode
 - 2) Pulse Counter Mode
 - c. Analog Outputs - shall be configured to output either of the following:
 - 1) Analog Output, Voltage Mode
 - 2) Analog Output, current Mode
 - d. Binary Outputs - shall output the following:
 - 1) 24 VAC Triac
 - e. Configurable Outputs - shall be capable of the following:
 - 1) Analog Output, Voltage Mode
 - 2) Binary Output Mode
6. The FEC shall have the ability to reside on a Field Controller Bus (FC Bus).
7. The FC Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
8. The FC Bus shall support communications between the FECs and NAE(s) or NCE(s).
9. The FC Bus shall also support Input/Output Module (IOM) communications with the FEC and with the NAE or NCE.
10. The FEC shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus). The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard Protocol SSPC-135, Clause 9.
11. The FEC shall support, but not be limited to, the following applications:
 - a. Optional chilled water/central plant optimization applications
 - b. Heating central plant applications
 - c. Built-up air handling units for special applications
 - d. Terminal & package units
 - e. Special programs as required for systems control
12. The FEC shall support the same Local Controller Display previously described for use with the Network Control Engine. All FEC controllers located indoors serving mechanical equipment other than ceiling hung terminal units shall be provided with their own Local Controller Display.

2.07 FIELD DEVICES

- A. Input/Output Module (IOM)
 1. The Input/Output Module (IOM) provides additional inputs and outputs for use in the FEC.
 2. The IOM shall communicate with the FEC over the FC Bus or the SA Bus.
 3. The IOM shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.
 - a. The IOM shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.
 - b. The IOM shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
 - c. A BACnet Protocol Implementation Conformance Statement shall be provided for the FEC.

4. The IOM shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
- B. Networked Thermostat (TEC)
 1. The networked thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters, reheat coil valves or other similar equipment.
 2. The TEC shall communicate over the Field Controller Bus using BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9.
 3. The TEC shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.
 - a. The TEC shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
 - b. A BACnet Protocol Implementation Conformance Statement shall be provided for the TEC.
 4. The Networked Thermostat shall support remote read/write and parameter adjustment from the web based User Interface through a Network Automation Engine.
 5. The Networked Thermostat shall include an intuitive User Interface providing plain text messages.
 - a. Two line, 8 character backlit display
 - b. LED indicators for Fan, Heat, and Cool status
 - c. Five (5) User Interface Keys
 - 1) Mode
 - 2) Fan
 - 3) Override
 - 4) Degrees C/F
 - 5) Up/Down
 - d. The display shall continuously scroll through the following parameters:
 - 1) Room Temperature
 - 2) System Mode
 - 3) Schedule Status - Occupied/Unoccupied/Override
 - 4) Applicable Alarms
 6. The Networked Thermostat shall provide the flexibility to support any one of the following inputs:
 - a. Integral Indoor Air Temperature Sensor
 - b. Duct Mount Air Temperature Sensor
 - c. Remote Indoor Air Temperature Sensor with Occupancy Override and LED Indicator
 - d. Two configurable binary inputs
 7. The Networked Thermostat shall provide the flexibility to support any one of the following outputs:
 - a. Three Speed Fan Control
 - b. Two On/Off
 - c. Two Floating
 - d. Two Proportional (0 to 10V)
 8. The Networked Thermostat shall provide a minimum of six (6) levels of keypad lockout.
 9. The Networked Thermostat shall provide the flexibility to adjust the following parameters:
 10. Adjustable Temporary Occupancy from 0 to 24 hours
 11. Adjustable heating/cooling deadband from 2° F to 5° F
 12. Adjustable heating/cooling cycles per hour from 4 to 8
 13. Where required by application and indicated on plans or room schedules provide the Networked Thermostat with an integral Passive Infra-Red (PIR) occupancy sensor.
 14. The Networked Thermostat shall employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.

2.08 SYSTEM TOOLS

A. System Configuration Tool (SCT)

1. The Configuration Tool shall be a software package enabling a computer platform to be used as a stand-alone engineering configuration tool for a Network Automation Engine (NAE).
2. The configuration tool shall provide an archive database for the configuration and application data.
3. The configuration tool shall have the same look-and-feel at the User Interface (UI) regardless of whether the configuration is being done online or offline.
4. The configuration tool shall include the following features:
 - a. Basic system navigation tree for connected networks
 - b. Integration of Metasys N1, LonWorks, and BACnet enabled devices
 - c. Customized user navigation trees
 - d. Point naming operating parameter setting
 - e. Graphic diagram configuration
 - f. Alarm and event message routing
 - g. Graphical logic connector tool for custom programming
 - h. Downloading, uploading, and archiving databases
5. The configuration tool shall have the capability to automatically discover field devices on connected buses and networks. Automatic discovery shall be available for the following field devices:
 - a. BACnet Devices
 - b. LonWorks devices
6. The configuration tool shall be capable of programming the Field Equipment Controllers.
 - a. The configuration tool shall provide the capability to configure, simulate, and commission the Field Equipment Controllers.
 - b. The configuration tool shall allow the FECs to be run in Simulation Mode to verify the applications.
 - c. The configuration tool shall contain a library of standard applications to be used for configuration.
7. The configuration tool shall be capable of programming the field devices.
 - a. The configuration tool shall provide the capability to configure, simulate, and commission the field devices.
 - b. The configuration tool shall allow the field devices to be run in Simulation Mode to verify the applications.
 - c. The configuration tool shall contain a library of standard applications to be used for configuration
8. A wireless access point shall allow a wireless enabled portable PC to make a temporary Ethernet connection to the automation network.
 - a. The wireless connection shall allow the PC to access configuration tool through the web browser using the User Interface (UI).
 - b. The wireless use of configuration tool shall be the same as a wired connection in every respect.
 - c. The wireless connection shall use the Bluetooth Wireless Technology.

2.09 INPUT DEVICES

A. General Requirements

1. Installation, testing, and calibration of all sensors, transmitters, and other input devices shall be provided to meet the system requirements.

B. Temperature Sensors

1. General Requirements:

- a. Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.
- b. The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.
- c. The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion:

Point Type	Accuracy
Accuracy	+/- .5°F
Room Temp	+/- .5°F
Duct Temperature	+/- .5°F
All Others	+/- .75°F

- 2. Room Temperature Sensors
 - a. Room sensors shall be constructed for either surface or wall box mounting.
 - b. Room sensors shall have the following options:
 - 1) Setpoint reset slide switch providing a +3 degree (adjustable) range.
 - 2) A momentary override request push button for activation of after-hours operation.
- 3. Room Temperature Sensors with Integral Display
 - a. Room sensors shall have an integral display when specified in the sequence of operations or elsewhere in these documents.
- 4. Thermo wells
 - a. When thermo wells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and Greenfield fitting.
 - b. Thermo wells shall be pressure rated and constructed in accordance with the system working pressure.
 - c. Thermo wells and sensors shall be mounted in a threadolet or 1/2" NPT saddle and allow easy access to the sensor for repair or replacement.
 - d. Thermo wells shall be constructed of 316 stainless steel.
- 5. Outside Air Sensors
 - a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
 - b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
 - c. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.
- 6. Duct Mount Sensors
 - a. Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.
 - b. Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.
 - c. For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.
- 7. Averaging Sensors
 - a. For ductwork greater in any dimension than 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.
 - b. For plenum applications, such as mixed air temperature measurements, a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.
 - c. Capillary supports at the sides of the duct shall be provided to support the sensing string.

C. Humidity Sensors

1. The sensor shall be a solid-state type, relative humidity sensor of the Bulk Polymer Design. The sensor element shall resist service contamination.
2. The humidity transmitter shall be equipped with non-interactive span and zero adjustments, a 2-wire isolated loop powered, 4-20 mA, 0-100% linear proportional output.
3. The humidity transmitter shall meet the following overall accuracy, including lead loss and Analog to Digital conversion. 3% between 20% and 80% RH @ 77 Deg F unless specified elsewhere.
4. Outside air relative humidity sensors shall be installed with a rain proof, perforated cover. The transmitter shall be installed in a NEMA 3R enclosure with sealtite fittings and stainless steel bushings.
5. A single point humidity calibrator shall be provided, if required, for field calibration. Transmitters shall be shipped factory pre-calibrated.
6. Duct type sensing probes shall be constructed of 304 stainless steel, and shall be equipped with a neoprene grommet, bushings, and a mounting bracket.

D. Differential Pressure Transmitters

1. General Air and Water Pressure Transmitter Requirements:
 - a. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.
 - b. Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.
 - c. Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device, and shall be supplied with Tee fittings and shut-off valves in the high and low sensing pick-up lines to allow the balancing Contractor and Owner permanent, easy-to-use connection.
 - d. A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.
2. Building Differential Air Pressure Applications (-1" to +1" w.c.)
 - a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
 - b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
 - 1) -1.00 to +1.00 w.c. input differential pressure ranges. (Select range appropriate for system application)
 - 2) 4-20 mA output.
 - 3) Maintain accuracy up to 20 to 1 ratio turndown.
 - 4) Reference Accuracy: +0.2% of full span.
3. Low Differential Air Pressure Applications (0" to 5" w.c.)
 - a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
 - b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
 - 1) (0.00 - 1.00" to 5.00") w.c. input differential pressure ranges. (Select range appropriate for system application.)
 - 2) 4-20 mA output.
 - 3) Maintain accuracy up to 20 to 1 ratio turndown.
 - 4) Reference Accuracy: +0.2% of full span.

- E. Status and Safety Switches
 - 1. General Requirements
 - a. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BMS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.
 - 2. Current Sensing Switches
 - a. The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.
 - b. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.
 - c. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.
 - d. Acceptable manufacturers: Veris Industries
 - 3. Air Filter Status Switches
 - a. Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120VAC.
 - b. A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.
 - c. Provide appropriate scale range and differential adjustment for intended service.
 - 4. Air Flow Switches
 - a. Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.
 - 5. Air Pressure Safety Switches
 - a. Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120VAC.
 - b. Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.
 - 6. Low Temperature Limit Switches
 - a. The low temperature limit switch shall be of the manual reset type with Double Pole/Single Throw snap acting contacts rated for 16 amps at 120VAC.
 - b. The sensing element shall be a minimum of 15 feet in length and shall react to the coldest 18-inch section. Element shall be mounted horizontally across duct in accordance with manufacturers recommended installation procedures.
 - c. For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream.

2.10 OUTPUT DEVICES

- A. Actuators
 - 1. General Requirements
 - a. Damper and valve actuators shall be electronic and/or pneumatic, as specified in the System Description section.
 - 2. Electronic Damper Actuators
 - a. Electronic damper actuators shall be direct shaft mount.
 - b. Modulating and two-position actuators shall be provided as required by the sequence of operations. Damper sections shall be sized Based on actuator manufacturer's recommendations for face velocity, differential pressure and damper type. The

actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the dampers, as required. All actuators (except terminal units) shall be furnished with mechanical spring return unless otherwise specified in the sequences of operations. All actuators shall have external adjustable stops to limit the travel in either direction, and a gear release to allow manual positioning.

- c. Modulating actuators shall accept 24 VAC or VDC power supply, consume no more than 15 VA, and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA, and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal and may be used to parallel other actuators and provide true position indication. The feedback signal of one damper actuator for each separately controlled damper shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
 - d. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Isolation, smoke, exhaust fan, and other dampers, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop associated fan. Two-position actuators, as specified in sequences of operations as "quick acting," shall move full stroke within 20 seconds. All smoke damper actuators shall be quick acting.
3. Electronic Valve Actuators
- a. Electronic valve actuators shall be manufactured by the valve manufacturer.
 - b. Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.
 - c. Modulating and two-position actuators shall be provided as required by the sequence of operations. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized Based on valve manufacturer's recommendations for flow and pressure differential. All actuators shall fail in the last position unless specified with mechanical spring return in the sequence of operations. The spring return feature shall permit normally open or normally closed positions of the valves, as required. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.
 - d. Modulating Actuators shall accept 24 VAC or VDC and 120 VAC power supply and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal, and may be used to parallel other actuators and provide true position indication. The feedback signal of each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
 - e. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Butterfly isolation and other valves, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop the associated pump or chiller.
- B. Control Valves
1. All automatic control valves shall be fully proportioning and provide near linear heat transfer control. The valves shall be quiet in operation and fail-safe open, closed, or in their last position. All valves shall operate in sequence with another valve when required by the sequence of operations. All control valves shall be sized by the control manufacturer, and shall be guaranteed to meet the heating and cooling loads, as specified. All control valves shall be suitable for the system flow conditions and close against the differential pressures involved. Body pressure rating and connection type (sweat, screwed, or flanged) shall conform to the pipe schedule elsewhere in this Specification.
 2. Chilled water control valves shall be modulating plug, ball, and/or butterfly, as required by the specific application. Modulating water valves shall be sized per manufacturer's recommendations for the given application. In general, valves (2 or 3-way) serving variable

flow air handling unit coils shall be sized for a pressure drop equal to the actual coil pressure drop, but no less than 5 PSI. Valves (3-way) serving constant flow air handling unit coils with secondary circuit pumps shall be sized for a pressure drop equal to 25% the actual coil pressure drop, but no less than 2 PSI. Mixing valves (3-way) serving secondary water circuits shall be sized for a pressure drop of no less than 5 PSI. Valves for terminal reheat coils shall be sized for a 2 PSIG pressure drop, but no more than a 5 PSI drop.

3. Ball valves shall be used for hot and chilled water applications, water terminal reheat coils, radiant panels, unit heaters, package air conditioning units, and fan coil units except those described hereinafter.
4. Modulating plug water valves of the single-seat type with equal percentage flow characteristics shall be used for all special applications as indicated on the valve schedule. Valve discs shall be composition type. Valve stems shall be stainless steel.
5. Butterfly valves shall be acceptable for modulating large flow applications greater than modulating plug valves, and for all two-position, open/close applications. In-line and/or three-way butterfly valves shall be heavy-duty pattern with a body rating comparable to the pipe rating, replaceable lining suitable for temperature of system, and a stainless steel vane. Valves for modulating service shall be sized and travel limited to 50 degrees of full open. Valves for isolation service shall be the same as the pipe. Valves in the closed position shall be bubble-tight.

C. Electronic Signal Isolation Transducers

1. A signal isolation transducer shall be provided whenever an analog output signal from the BMS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.
2. The signal isolation transducer shall provide ground plane isolation between systems.
3. Signals shall provide optical isolation between systems.
4. Acceptable manufacturers: Advanced Control Technologies

2.11 MISCELLANEOUS DEVICES

A. Local Control Panels

1. All control panels shall be factory constructed, incorporating the BMS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush latch.
2. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices-such as relays, transducers, and so forth-that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.
3. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.
4. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.
5. All wiring shall be neatly installed in plastic trays or tie-wrapped.
6. A 120 volt convenience outlet, fused on/off power switch, and required transformers shall be provided in each enclosure.

PART 3 - PERFORMANCE/EXECUTION

3.01 BMS SPECIFIC REQUIREMENTS

A. Graphic Displays

1. Provide a color graphic system flow diagram display for each system with all points as indicated on the point list. All terminal unit graphic displays shall be from a standard design library.
 2. User shall access the various system schematics via a graphical penetration scheme and/or menu selection. .
- B. Remote Access:
1. (Optional) Via the Metasys Ready Access Portal software provide the Owner the ability to use a smart device such as a tablet PC, I-phone or other smart hone, to remotely monitor and control the BMS system. Provide unique login passwords to limit the remote user to the AC unit associated with his/her space within the building.

3.02 INSTALLATION PRACTICES

- A. BMS Wiring
1. All conduit, wiring, accessories and wiring connections required for the installation of the Building Management System, as herein specified, shall be provided by the BMS Contractor unless specifically shown on the Electrical Drawings under Division 16 Electrical. All wiring shall comply with the requirements of applicable portions of Division 16 and all local and national electric codes, unless specified otherwise in this section.
 2. All BMS wiring materials and installation methods shall comply with BMS manufacturer recommendations.
 3. The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
 4. Class 2 Wiring
 - a. All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.
 - b. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.
 5. Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.
 6. Provide for complete grounding of all applicable signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.
- B. BMS Line Voltage Power Source
1. 120-volt AC circuits used for the Building Management System shall be taken from panel boards and circuit breakers provided by Division 16.
 2. Circuits used for the BMS shall be dedicated to the BMS and shall not be used for any other purposes.
 3. DDC terminal unit controllers may use AC power from motor power circuits.
- C. BMS Raceway
1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 3/4".
 2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
 3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.

4. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.
- D. Penetrations
1. Provide fire stopping for all penetrations used by dedicated BMS conduits and raceways.
 2. All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.
 3. All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.
 4. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.
- E. BMS Identification Standards
1. Node Identification. All nodes shall be identified by a permanent label fastened to the enclosure. Labels shall be suitable for the node location.
 - a. Cable types specified in Item A shall be color coded for easy identification and troubleshooting.
- F. BMS Panel Installation
1. The BMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
 2. The BMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.
- G. Input Devices
1. All Input devices shall be installed per the manufacturer recommendation
 2. Locate components of the BMS in accessible local control panels wherever possible.
- H. HVAC Input Devices - General
1. All Input devices shall be installed per the manufacturer recommendation
 2. Locate components of the BMS in accessible local control panels wherever possible.
 3. The mechanical contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.
 4. Outside Air Sensors
 - a. Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outside air conditions accurately.
 - b. Sensors shall be installed with a rain proof, perforated cover.
 5. Building Differential Air Pressure Applications (-1" to +1" w.c.):
 - a. Transmitters exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.
 - b. The interior tip shall be inconspicuous and located as shown on the drawings.
 6. Duct Temperature Sensors:
 - a. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.
 - b. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.
 - c. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.
 - d. The sensor shall be mounted to suitable supports using factory approved element holders.
 7. Space Sensors:
 - a. Shall be mounted per ADA requirements.

- b. Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.
 8. Low Temperature Limit Switches:
 - a. Install on the discharge side of the first water or steam coil in the air stream.
 - b. Mount element horizontally across duct in a serpentine pattern insuring each square foot of coil is protected by 1 foot of sensor.
 - c. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.
 9. Air Differential Pressure Status Switches:
 - a. Install with static pressure tips, tubing, fittings, and air filter.
 10. Water Differential Pressure Status Switches:
 - a. Install with shut off valves for isolation.
- I. HVAC Output Devices
 1. All output devices shall be installed per the manufacturers recommendation. The mechanical contractor shall install all in-line devices such as control valves, dampers, airflow stations, pressure wells, etc.
 2. Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke.
 3. Control Dampers: Shall be opposed blade for modulating control of airflow. Parallel blade dampers shall be installed for two position applications.
 4. Control Valves: Shall be sized for proper flow control with equal percentage valve plugs. The maximum pressure drop for water applications shall be 5 PSI. The maximum pressure drop for steam applications shall be 7 PSI.

3.03 TRAINING

- A. The BMS contractor shall provide the following training services:
 1. Forty (40) hours of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

3.04 COMMISSIONING

- A. Fully commission all aspects of the Building Management System work.
- B. Acceptance Check Sheet
 1. Prepare a check sheet that includes all points for all functions of the BMS as indicated on the point list included in this specification.
 2. Submit the check sheet to the Engineer for approval
 3. The Engineer will use the check sheet as the basis for acceptance with the BMS Contractor.
- C. Promptly rectify all listed deficiencies and submit to the Engineer that this has been done.

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. 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.
 - 2. Steam Valves: 150% of operating (inlet) pressure.
- C. Valve Failure Position:
 - 1. Valves shall fail normally open or closed as indicated on the Drawings or as follows:
 - a. Heating coils in air handlers - normally open.
 - b. Chilled water control valves - normally closed
 - c. 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.
- E. Steam Valves:
 - 1. Body and trim materials shall be as specified in "Pipe, Valve & Fittings" specification. Linear ports for modulating service.

2. Sizing Criteria:
 - a. Two-position service: pressure drop 10% to 20% of inlet pressure (psig).
 - b. Modulating service 15 psig or less: pressure drop 80% of inlet pressure (psig).
 - c. Modulating service 16 psig to 50 psig: pressure drop as scheduled on plans.
 - d. In all cases above the contractor shall verify sizing criteria with the valve 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 $\pm 1\%$ 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 $\pm 1\%$ 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 STATIC PRESSURE SENSORS

- A. Sensor shall have linear output signal. Zero and span shall be field-adjustable.
- B. Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.
- C. Water pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Sensor shall be complete with 4-20 ma output, required mounting brackets, and block and bleed valves. Mount in location accessible for service.
- D. Water differential pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (DP) and maximum static pressure shall be 3,000 psi. Transmitter shall be complete with 4-20 ma output, required mounting brackets, and five-valve manifold. Mount in a location accessible for service.

2.08 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.

2.09 FLOW SWITCHES

- A. Flow-proving switches shall be either paddle or differential pressure type, as shown on the Drawings or as specified.
- B. Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA 1 Type enclosure unless otherwise specified:
- C. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 Type enclosure, with scale range and differential suitable for intended application, or as specified.
- D. Current sensing relays may be used for flow sensing or terminal devices.

2.10 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.

2.11 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.

2.12 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.

2.13 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.

2.14 AIR FLOW MEASURING STATIONS

- A. Air flow measuring stations shall be multi-point, multi-axis flow ring or cross sensor. Single point or flow bar sensors are not acceptable. The airflow measurement station shall measure from 15 percent to 100 percent of unit nominal airflow. The air flow measuring station shall adjust for temperature variations and shall provide a 2 to 10 Vdc signal that corresponds to actual airflow for controlling and documenting airflow. The accuracy of the airflow measurement station shall be +/- 5 percent.
- B. Air flow measuring stations shall be provided by the air handler manufacturer or the VAV box manufacturer. See air handler or VAV box specification section for more details.

2.15 WALL MOUNTED CARBON DIOXIDE SENSORS

- A. Carbon dioxide sensors shall be of the wall mounted type.
- B. Sensors shall be of the auto-calibrated type designed to operate from 24VAC or 24VDC power.
- C. Range: 0-2000 ppm CO₂
- D. Accuracy: ±30 ppm CO₂ + 3% of reading
- E. Annual Zero Drift: ±10 ppm
- F. Response Time: < 3 minutes
- G. Output Signals:
 - 1. 0-10 VDC
 - 2. 4-10 mA or 2-10 VDC
- H. Resolution of Analog Outputs: 2 ppm CO₂
- I. Housing Material: Polycarbonate/ABS blend
- J. 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.

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

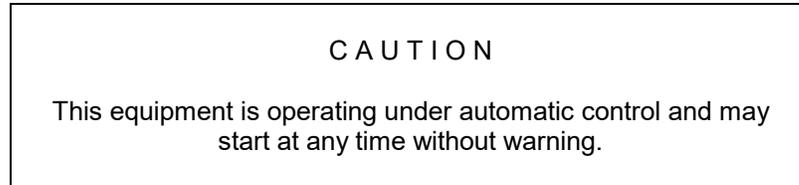
- A. Install using a thread-o-let in steel pipe. In copper pipe use C x C x F Tee, no pipe extensions or substitutions allowed.
- B. Mount a minimum of 5 pipe diameters upstream and 5 pipe diameters downstream or 2 feet which ever is greater, from fittings and other obstructions.
- C. Install in accordance 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:



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. Section 230923 - Automatic Temperature Controls and Building Automation System
- B. Division 26
- C. Owner's Building Management System (BMS)
- D. 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 - GENERAL

- A. All thermostats whether provided by the HVAC equipment manufacturer or the controls manufacturer shall be provided with matching locking protective plastic or metal covers by the controls manufacturer in order to prevent unauthorized tampering and vandalism.

3.03 SEQUENCE OF OPERATION - TOILET EXHAUST FANS

- A. The toilet exhaust fan shall be interfaced to the existing automatic temperature control panel & system. In the auto mode, the exhaust fans shall be indexed for occupied - unoccupied modes of operation through the ATC system. During the occupied cycle, the respective exhaust fans shall run continuously. During the unoccupied cycle, the respective exhaust fans shall remain off.
- B. If the toilet exhaust fan has a motorized damper, the damper shall open when the fan is enabled to run. Provide an end switch to prove the damper is open.
- C. For exhaust fans with a duct smoke detector, see Sequence of Operation - Duct Smoke Detectors.

3.04 SEQUENCE OF OPERATION - FIN TUBE RADIATION OR CONVECTORS

- A. DDC or Electric Control Valve: Fin tube radiation and/or convectors shall be provided with DDC or electric control valve and remote return air thermostat or wall thermostat, which shall modulate the control valve to maintain temperature set point.

3.05 SEQUENCE OF OPEERATION - DUCT SMOKE DETECTORS

- A. A duct smoke detector shall be furnished by the electrical contractor and installed in the ductwork by the mechanical contractor. The electrical contractor shall provide wiring from the duct smoke detector to the associated unit's motor starter and to the building fire alarm system. Whenever products of combustion are sensed, the unit's fans will shut down.
- B. The electrical contractor shall provide wiring from the building's fire alarm system to a set of contacts at the HVAC unit's control panel to indicate a fire alarm condition and for secondary shutdown.
- C. The mechanical contractor shall provide wiring from an additional set of contacts from the duct smoke detector to the HVAC unit's control panel to indicate a fire alarm condition and for secondary shutdown.

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	Threaded Connections	
	2 ½ inches & larger	Welded Connections	
Fittings	2 inches & smaller	125#, cast iron, threaded, ASTM A126	Anvil
	2 ½ inches & larger	Standard Weight, Seamless steel, butt welded, ASTM A234	Weldbend

Item	Pipe Size	Description	Manufacturer/ Model No.
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	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	Nibco T-124
	2 ½ inches & larger	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 F-617-O
Swing Check Valves	2 inches & smaller	Class 125, Y-pattern swing type, threaded connections, bronze body with TFE seat disc. MSS-SP80, ASTM B 62	Nibco T413-Y
	2 ½ inches & larger	Class 125, swing-type, flanged connections, cast iron body with bronze trim, non asbestos gasket. MSS-SP71, ASTM A-126 Class B	Nibco F918-B
Globe Valves	2 inches & smaller	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	Nibco T-235-Y
	2 ½ inches & larger	Class 125, flanged connections, cast-iron body and bonnet with bronze trim, 200 psig CWP rating. ASTM A-126 Class B	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
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

2.03 PNEUMATIC CONTROLS PIPING

- A. Material:
1. Copper: Seamless copper tubing, with copper or brass solder fittings and Type I solder.
 2. Non-metallic: Virgin polyethylene tubing, conforming to ASTM Type 1, Grade 5, Class B or C meeting stress crack test in accordance with ASTM D1693. For individual air tubes in multi-tube instrument tubing harnesses conform to the above, complete with a Mylar barrier and a solid vinyl outer jacket a minimum of .062" thick. Brass, aluminum or delrin fittings, of the compression or barb push-on type, designed for instrument service.

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 STEAM AND CONDENSATE PIPING SYSTEMS

- A. Install drip legs with steam traps at low points and natural drainage points in the steam system, such as at the ends of mains, bottoms of risers, and ahead of pressure regulators, control valves, isolation valves, pipe bends, and expansion joints.
- B. On straight runs with no natural drainage points, install drip legs with steam traps at intervals not exceeding 150 feet where pipe is pitched down in the direction of the steam flow and a maximum of 100 feet where the pipe is pitched up so that condensate flow is opposite of steam flow.
- C. Size drip legs same diameter as the main up to 6 inches. In steam mains 6 inches and larger, provide drip legs half the size of the distribution line but never less than 6 inches. The length of the drip leg; 1-1/2 times the diameter of the distribution line but not less than 18 inches.

- D. Equip drip legs and dirt pockets with capped gate valves to allow removal of dirt and scale.
- E. In piping systems installed horizontally, make reductions in pipe sizes using eccentric reducer fitting installed with the level side down.
- F. Install steam supply piping at a uniform grade of 1/4 inch in ten feet downward in the direction of flow or toward the trap when a trap is present.
- G. Install condensate return piping at a uniform grade of 1/2 inch in ten feet downward in the direction of flow.
- H. Install automatic air vents at the end of all steam mains and headers, and on large equipment steam spaces to facilitate start-up and heat transfer. Locate the air vent at a high point of the piping system or equipment, or where the air collects. Pipe the outlet to a safe place, cut the pipe end at a 45 degree angle. Install an isolation valve upstream of automatic air vents.

3.03 PNEUMATIC CONTROLS PIPING

- A. Installation:
 - 1. Conceal all control systems air piping wherever possible. Copper air tubing in Mechanical Equipment, Steam Service, Machine and Boiler Rooms and Penthouse Mechanical Equipment Rooms may be installed exposed. Provide air piping a minimum of 1/4" O.D., with the exception that 1/8" O.D. seamless copper tubing will be permitted in branch runs to individual thermostats.
 - 2. Provide hard temper copper tubing where exposed; concealed piping may be hard temper or soft annealed copper tubing. Run tubing parallel to the building lines. Bend tubing with bending tools. Use copper or brass solder type fittings, with the exception that all connections to apparatus or equipment must be made with compression or flare type fittings.
 - 3. Support air tubing in an approved manner, with all overhead lines run parallel to each other, supported by clevis or trapeze hangers on maximum 5 foot centers, or by attachment to adjacent piping or electrical conduit.
 - 4. Non-metallic air tubing may be used for temperature and humidity control systems, installed in accordance with the following:
 - a. Run exposed non-metallic tubing in Mechanical Equipment, Steam Service and Machine Rooms, Penthouse Mechanical Equipment Rooms, Finished Rooms or Finished Spaces in E.M.T. Install hard temper copper tubing for individual terminal runs, with the exception of terminal runs less than one foot in length, in which case flexible polyethylene tubing may be used.
 - b. Non-metallic multi-tube instrument tubing harness may be installed in concealed locations such as pipe chases, suspended ceilings or within wall construction. Single tube runs in the above locations shall be copper.
 - c. Non-metallic tubing may be installed inside control panels, within air conditioner and unit ventilator enclosures and other similar locations as approved. Number or color code, neatly tie and support tubing. Neatly and securely fasten flexible tubing connections, bridging control cabinet and its panel door, along hinge side of door and protect from abrasion.
 - 5. Periodically test all tubing during the piping installation. Prior to connection to control instruments or apparatus, blow out all tubing runs to rid system of dust, dirt and moisture, and test entire piping system under 40 lbs. air pressure for 24 hours, during which time pressure shall not drop more than 10 lbs.

3.04 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.

3.05 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.

3.06 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.

3.07 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.

3.08 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.

3.09 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. Provide 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)
1/2"-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

3.10 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.

3.11 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)
Fuel Oil Piping	Pneumatic		1.25 times maximum working pressure
Steam Piping	Hydrostatic		1.5 times maximum working pressure, but not less than 100 psi
Condensate Piping	Hydrostatic		1.5 times maximum working pressure, but not less than 100 psi
Natural Gas Piping	Pneumatic		1.5 times maximum working pressure but not less than 3 psig
Natural Gas Piping (In Schools)	Pneumatic		Working pressures up to 12" W.C. = 15 psig test pressure for 1 hour. Working pressures above 12" W.C. = 1.5 times the working pressure or a minimum of 50 psig for 1 hour.
Domestic Water Piping	Hydrostatic		1.5 times maximum working pressure, but not less than 100 psi
Condenser Water Supply & Return	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

3.12 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.

3.13 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.

3.14 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 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	Hot Water	60° to 240°F
Pressure Gauges	Hot Water	0 to 60 psi
Thermometer	Chilled Water	30° to 100°F
Pressure Gauges	Chilled Water	0 to 60 psi
Thermometer	Steam/Condensate	0 to 60 psi
Pressure Gauges	Steam/Condensate	0 to 60 psi

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.

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 the pipe specialties for piping systems including, but not limited, to the following:
 - 1. Drain Valves
 - 2. Strainers
 - 3. Escutcheons
 - 4. Dielectric Connections

1.02 REFERENCES

- A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.

1.03 SUBMITTALS

- A. Product Data: Submit product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes and finishes. Include produce description, model and dimensions.
- B. Submit manufacturer's instructions for maintenance and repair.
- C. Submit 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 making 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 DRAIN VALVE

- A. Provide drain valves, ball type with $\frac{3}{4}$ inch hose connector, at all low points of water systems, on strainers, and in all locations as shown on the Drawings. Provide minimum $\frac{3}{4}$ inch drain size. Provide caps or plugs with chain at all drain and fill valves.

2.02 STRAINERS

- A. General:
 - 1. Provide strainers ahead of all pumps, automatic control valves, as specified for piping installations, as shown on the Drawings, and as required for proper functioning of equipment.
- B. Steam and Water Strainers

1. "Y" type or "Basket" type, as shown on the Drawings.
2. Provide a strainer screen blow down valve the full size of the blow-off tapping for each strainer. Provide gate valves for steam service and ball valve with ½ inch hose end for water service.
3. Stainless steel strainer screens with perforations as follows:

Pipe Size (Inches)	Water Service Perforations (Inches)	Steam Service Perforations (Inches)
Thru 4	1/16 (except at cooling tower pumps shall be 1/8)	1/32
Over 4	1/8	3/64

4. Select the length of the nipple connecting the blow-off valve to the strainer basket flange so that the blow-off valve is clear of the insulation.
5. Select strainers with bodies compatible with connected piping from the following schedule for the service intended.

Size	Manufacturer	Strainer Type	Model No.	Description
2 inches & smaller	Mueller Steam Specialty	Y	11M	Cast iron body, threaded ends, ANSI Class 250
2 inches & smaller	Mueller Steam Specialty	Y	358S	Bronze body, soldered ends, ANSI Class 125, for copper pipe
2 ½ inches & larger	Mueller Steam Specialty	Y	758	Cast iron body, flanged ends, ANSI Class 125
2 inches & smaller	Mueller Steam Specialty	Basket	125	Cast iron body, screwed ends, ANSI Class 125
2 inches & smaller	Mueller Steam Specialty	Basket	125B	Bronze body, screwed ends, ANSI Class 150, for copper pipe
2 ½ inches & larger	Mueller Steam Specialty	Basket	166	Cast iron body, flanged ends, ANSI Class 250

2.03 ESCUTCHEONS

- A. Provide escutcheons with spring-catch fasteners at all locations where insulated or uninsulated piping, installed exposed to view, penetrates wall, partitions, floors, and ceilings.
- B. Plain pattern, chrome-plated brass for all piping except galvanized steel.
- C. Galvanized around galvanized steel pipe.
- D. Deep recess to cover sleeves at floor penetrations.

2.04 DIELECTRIC CONNECTIONS

- A. Approved Manufacturer: Watts Regulator Series 3000 Dielectric Unions and Flange Systems

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Install work in accordance with manufacturer's instructions and as shown on the Drawings.
- B. Furnish and connect to all valves, brass tags, polished or lacquered, with stamp lettering or numbers filled in with black paint. Identify each zone.
- C. See "Pipe, Valve and Fitting" Specification for more information.
- D. Secure escutcheons to the pipe or insulation and flush with the building surface.
- E. Clean the valves and place them in final operating position

3.02 STRAINER INSTALLATION

- A. Installed strainers so they are readily accessible
- B. Remove start-up strainer screen from suction diffusers and strainers and install permanent screens prior to balancing water systems.

3.03 DIELECTRIC CONNECTIONS

- A. Isolate connections between dissimilar metallic materials. 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.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section describes steam specialties, including thermostatic air vents, vacuum breakers 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 an 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.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Install Work in accordance with manufacturer's instructions and as shown on the Drawings.

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 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.

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. 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.
- H. 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.

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 than 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 COMBINATION FIRE SMOKE DAMPERS

- A. Fabricate and install in accordance with NFPA 90A and UL Safety Standards 555 & 555S, 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. Leakage Class: Leakage Class II per UL 555S
- D. Fusible links, UL 33, shall separate at 165 degrees F.

OR
- E. Resettable links shall be provided in lieu of a fusible link. Resettable link shall interrupt power to the actuator causing the actuator's spring return mechanism to cause the damper to close at 165 degrees F. Resettable link to be provided with an electric sensor (thermostat). Sensor to be of the manual reset type and shall be capable of being reset after the temperature has cooled down below the sensor set point.
- F. Pressure Differential Rating: 4 In. w. g.
- G. Air Flow Velocity: 2000 fpm
- H. Elevated Temperature Rating: 350 Deg. F per UL555S
- I. 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.
- J. Actuators: 24 VDC, 2-position, external mounting
- K. Acceptable Manufacturers:
 - 1. Greenheck Model FSD-200
 - 2. Ruskin Mfr. Co.
 - 3. Arrow Damper & Louver.
 - 4. Imperial Damper Co.

2.12 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.

2.13 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

2.14 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.

2.15 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 in direction 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 $\pm 1/8$ ".
- 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
Kitchen Exhaust	Black Iron
Shower Room Exhaust	Aluminum
Ductwork Exposed to Weather	Aluminum
Dishwasher Hood Exhaust	Type 302 or 304 Stainless Steel
Laboratory Exhaust Fume Hood	Type 316 Stainless Steel
Clothes Dryer Exhaust	Rigid Metal

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.

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 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 into ceiling grids or for surface mount in other ceiling types.
6. Manufacturer: Nailor Industries Inc, Model Series RNS or approved equal.
7. Coordinate color with Owner

B. Round Ceiling Diffusers:

1. Furnish and install round ceiling diffusers of the sizes and capacities as shown on the Drawings.
2. Manufactured the diffuser from corrosion-resistant steel or extruded aluminum as indicated on the Drawings.
3. Round, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with sectorizing baffles where indicated. Size diffuser collar to project not more than one inch above ceiling.
4. Provide a radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.
5. Manufacture diffusers with trim to allow for recessed mounting into ceiling grids or for surface mount in other ceiling types.
6. Manufacturer: Nailor Industries Inc. Model Series RNR or approved equal.
7. Coordinate color with Owner.

C. Architectural Ceiling Diffusers:

1. Furnish and install architectural 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 units of a stamped outer core and with the inner core having a plaque style face. Construct the face with a double skinned inner face panel with a hemmed edge. Manufacture the inner core assembly to be removable using a spring clip arrangement that permits quick, easy installation and removal.
4. Manufacture diffusers with trim to allow for with face panel flush with the ceiling line into ceiling grids or for surface mount in other ceiling types.
5. Provide an opposed blade radial volume damper, with an operating arm to adjust the damper without removing the core. Unit collar height; 1 1/4" in height.
6. Provide an equalizing grid for field installation for each diffuser.
7. Manufacturer: Nailor Industries Inc., Model Series UNI or approved equal.
8. Coordinate color with Owner.

D. Architectural High Ceiling Perforated Diffusers:

1. Furnish and install architectural high ceiling perforated diffusers of the sizes and capacities as shown on the Drawings.
 2. Manufacture the diffuser from corrosion-resistant steel.
 3. Construct the units of a stamped one-piece outer cone and a heavy gauge inner face panel with a hemmed edge.
 4. Perforated face shall have 3/8" diameter holes on 5/8" staggered centers.
 5. Provide an opposed blade radial volume damper, with an operating arm to adjust the damper without removing the core. Unit collar height; 1 1/4" in height.
 6. Manufacturer: Nailor Industries Inc., Model Series UNI-PD or approved equal.
 7. Coordinate color with Owner.
- E. Architectural High Ceiling Adjustable Downblast Diffusers:
1. Furnish and install architectural high ceiling perforated diffusers of the sizes and capacities as shown on the Drawings.
 2. Manufacture the diffuser from corrosion-resistant steel.
 3. Construct the units of a stamped one-piece outer cone and a inner core that has a square face plate and includes a round, easily adjustable radial vane in the center.
 4. The radial vane shall have a ring operator that allows for pole operation.
 5. Provide an opposed blade radial volume damper, with an operating arm to adjust the damper without removing the core. Unit collar height; 1 1/4" in height.
 6. Manufacturer: Nailor Industries Inc., Model Series UNI-AD 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: Nailor Industries Inc, Model Series 6145H-O or approved equal.
- F. Coordinate color with Owner.

2.03 HEAVY DUTY STEEL RETURN GRILLES

- A. Furnish and install heavy duty return grilles of the type and size as shown on the Drawings. Construct the grilles with 45 degree deflection fixed 14 gauge steel blades spaced on 1/2" centers and a heavy duty 16 gauge steel welded frame.
- 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: Nailor Industries Inc, Model Series 6145H-HD-O or approved equal.
- F. Coordinate color with Owner.

2.04 HEAVY DUTY ALUMINUM RETURN GRILLES

- A. Furnish and install heavy duty return grilles of the type and size as shown on the Drawings. Construct the grilles with 0 degree deflection aluminum blades spaced on $\frac{1}{2}$ " centers and a heavy duty aluminum welded frame.
- 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. Nailor Industries Inc, Model Series 51FH-HD-OA or approved equal.
- F. Coordinate color with Owner.

2.05 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 $\frac{3}{4}$ " 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.

2.06 TRANSFER GRILLES

- A. Furnish and install supply grilles of the type and size as shown on the Drawings. Grilles shall be sight proof.
- B. Construct the units of extruded aluminum or corrosion resistant steel as shown on the Drawings.
- C. The grille shall have inverted "V" shaped blades and frames. The grille shall be sight-proof.

- D. Manufacturer: Nailor Industries Inc., Model Series 61DGS or approved equal.
- E. Coordinate color with Owner.

2.07 LINEAR DIFFUSERS

- A. Furnish and install linear slot diffusers and accessories of the size and type shown on the drawings. Mechanical contractor shall coordinate installation with General Contractor and other subcontractors as required.
- B. The linear slot diffuser shall utilize heavy wall extruded aluminum frames and be capable of supporting the ceiling system. Material shall be minimum wall thickness 0.06" (1.52). Diffuser frames shall be supplied with integral spacer bars and hanger brackets, spaced approximately on 24" (610) centers. In hard ceiling installations, provide support clips by the manufacturer that allow the diffusers to be secured to the ceiling diffuser opening framing channels.
- C. The linear slot diffuser shall be complete with factory end border configurations as shown or indicated. Where exposed end caps are required, they shall be factory installed architectural mitered picture frame type. Flanges/butt type end caps are not acceptable.
- D. Provide alignment strips and spline clips by the manufacturer to secure joints and ceiling tees to the linear diffuser as required. Mitered corner sections shall be supplied by the manufacturer in one-piece construction.
- E. The air pattern controller shall be dual type on 24" (610) centers and fully adjustable to permit various air pattern configurations, as well as allow throttling, as required for air volume reduction or complete shut-off without adding any blank-off devices. Pattern controllers shall be minimum 20 ga. (1.01) corrosion-resistant steel. One-piece pattern controllers are not acceptable.
- F. Linear slot diffusers shall incorporate vertical jet throw pattern controllers.
- G. All diffusers shall have a single slot, unless shown otherwise, and shall be capable of being used for supply, return or exhaust air.
- H. Supply air engineered plenum boots shall be minimum 22 ga. (0.85) coated steel and of the same manufacturer as the linear slot diffuser. Lengths and inlet sizes shall be as indicated on the plans and schedules. Where required, plenums shall be insulated with either internal matt faced fiberglass insulation or external foil back insulation, as specified on drawings or schedules. Return hood/sight baffles shall be provided as shown.
- I. Pattern controllers and integral spacers shall be painted flat black.
- J. Performance of the linear slot diffuser shall be based upon cataloged data obtained from tests conducted in accordance with ASHRAE Standard 70, latest edition. Pattern controllers shall be field adjusted after diffuser installation and set in their normal operating condition. Air test and balancing of linear slot diffusers shall be in accordance with the testing and balancing portion section of the specifications.
- K. Provide manufacturers submittal drawings and published performance data.
- L. Manufacturer: Nailor Industries Inc., Continuous Flowline Series Model FLV15 or approved equal.

2.08 LINEAR SLOT SUPPLY AND RETURN DIFFUSERS

- A. Furnish and install linear slot diffusers of the type and size as shown on the plans and air distribution schedules.
- B. The maximum length of a single section shall be 72" long. All sizes larger than 72" shall be provided in continuous multiple sections. Alignment strips shall be provided for joining continuous diffuser sections together.
- C. The frame borders and end caps shall be extruded aluminum with extruded aluminum spacers.
- D. The linear slot shall be supplied in 1 to 10 slots wide as specified.
- E. Pattern deflectors shall have an aerodynamic 'ice tong' shape that can be adjusted to regulate the volume and direction of the airflow. The maximum length of the deflectors shall be 36", longer sizes shall be provided in multiple sections. The pattern deflector finish shall be black.
- F. Provide inactive sections with blank-offs, end caps, 90 degree mitered corners, etc. as necessary to provide a continuous appearance in areas with multiple section assemblies.
- G. Manufacturer of Linear Slot Diffusers shall be Nailor Industries Inc., Model Series 5000 or approved equal.
- H. Coordinate color with owner.

2.09 LINEAR SLOT DIFFUSER PLENUMS

- A. Furnish and install plenums for linear slot diffusers of the sizes and capacities as shown on the plans and air distribution schedule.
- B. The plenums shall be manufactured from corrosion-resistant steel and shall include a side inlet for connection to the duct.
- C. The width shall fit a 1, 2, 3, or 4 slot linear diffuser as specified and the length shall be in standard nominal lengths of 20", 24", 30", 36", 48", and 60".
- D. When continuous sections are required, the end caps shall be folded up for uninterrupted airflow.
- E. Models 5310I, 5375I, and 5350I shall have internal insulation.
- F. Manufacturer of Linear Slot Diffuser Plenums shall be Nailor Industries Inc., Model Series 5300 or approved equal.

2.10 LINEAR FLOOR DIFFUSERS

- A. Furnish and install linear floor diffusers of the type and size as shown on the plans and air distribution schedules.
- B. Linear floor diffusers shall be designed for installation in the floor.
- C. The diffuser shall have 15 degree deflection bars set on 1/2" centers.
- D. The entire assembly shall be constructed of etched and anodized extruded aluminum.

- E. Manufacturer of Linear Floor Diffusers shall be Reliable Products Model LFD15 or approved equal.
- F. Coordinate color with owner.

2.11 CURVED SPIRAL DUCT GRILLES

- A. Furnish and install curved spiral duct grilles of the type and size as shown on the Drawings. Construct the grilles with a dual set of extruded aluminum blades that are spaced on $\frac{3}{4}$ " centers. The frame shall be corrosion-resistant steel and rolled to match the specified radius.
- B. Provide each unit with a damper extractor constructed of heavy gauge corrosion-resistant steel and operable from the face of the grille (Nailor Industries Inc. Model DEX).
- C. Manufacturer: Nailor Industries Inc., Model Series 61DVC or approved equal.

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 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 232000: Pipe, Valves, and Fittings.
- B. Section 232201: Steam Specialties.
- C. Section 232202: Steam Traps.

1.02 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's catalog sheets, brochures, performance charts, standard finish chart, specifications and installation instructions for each item specified.
 - 2. Schedule: Itemize pipe or tube size and material, fin size and material, fin thickness, fin spacing per linear foot, actual finned length of each element, number of rows of element and rating in Btuh per linear foot of finned element (single or double row) and location of installation (room or space number).

1.03 PRODUCT DELIVERY

- A. Deliver equipment in original shipping containers, properly labeled as to type, size and finish.

1.04 MAINTENANCE

- A. Special Tools: One tool for each type and size vandal resistant fastener.

PART 2 - PRODUCTS

2.01 STEAM CONVECTORS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Sterling.
 - 2. Slant/Fin.
 - 3. Vulcan.
 - 4. Modine.
 - 5. Trane.
 - 6. Rittling.
- B. See design drawing floor plans, details, and equipment schedules for additional information, capacities, enclosure types, accessories, etc.
- C. Finish: Factory-applied baked enamel in manufacturer's color as selected by the architect.
- D. Convector Elements:
 - 1. Seamless copper tubing mechanically expanded into evenly spaced aluminum fins and cast-iron headers; steel side plates and supports; factory-pressure tested at 100 psig underwater.
- E. Enclosures:
 - 1. Steel with exposed corners rounded; removable front panels with tamperproof fasteners braced and reinforced for stiffness.
 - a. Front and Top: 14 Ga. steel.
 - b. Back and Ends: 14 Ga. steel.

- c. Access Doors: Factory made, permanently hinged with Allen-head camlock fastener, minimum size 6 by 7 inches, integral with enclosure for otherwise inaccessible valves.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install the Work of this Section in accordance with the manufacturer's printed instructions unless otherwise shown or specified.
- B. Install all units level and plumb.
- C. Install control valves as required by Section "Automatic Temperature Controls."
- D. Connect steam units and components to piping according to piping section for "Steam and Condensate Piping."
 - 1. Install shutoff valve on inlet; install strainer, steam trap, and shutoff valve on outlet.
- E. Install valves, specialties, and piping to allow for service and maintenance.
- F. Provide/install access doors for where appropriate for access to valves and other fittings.

3.02 EXAMINATION

- A. Examine areas to receive convectors for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping or electrical connections to verify actual locations before convector installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 CLEANING

- A. A. After completing system installation, including outlet fittings and devices, inspect for damage to exposed finish. Repair damaged finish to match original finish.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Report discrepancies to Architect/Engineer before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- C. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify Owner before partially or completely disabling system.
 - 2. Notify local fire service.
 - 3. Make notifications at least 24 hours in advance.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

- F. Repair adjacent construction and finishes damaged during demolition and extension work.
- G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- H. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Wire pulling lubricant.
- G. Cable ties.
- H. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- C. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 284600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- M. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- N. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- P. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Metal-clad cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.

- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- E. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- F. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- G. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
 - 2. Control Circuits: 14 AWG.
- H. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- I. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 - 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 - 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
 - c. Southwire Company: www.southwire.com/#sle.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.

- b. Size 8 AWG and Larger: Stranded.
- 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2.

2.04 METAL-CLAD CABLE

- A. Manufacturers:
 - 1. AFC Cable Systems Inc: www.afcweb.com/#sle.
 - 2. Encore Wire Corporation: www.encorewire.com/#sle.
 - 3. Southwire Company: www.southwire.com/#sle.
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Provide dedicated neutral conductor for each phase conductor where indicated or required.
- G. Grounding: Full-size integral equipment grounding conductor.
- H. Armor: Steel, interlocked tape.

2.05 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

- F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
 - 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - c. NSI Industries LLC: www.nsiindustries.com/#sle.
- G. Mechanical Connectors: Provide bolted type or set-screw type.
 - 1. Manufacturers:
 - a. Burndy LLC; _____: www.burndy.com/#sle.
 - b. Thomas & Betts Corporation: www.tnb.com/#sle.
- H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.06 ACCESSORIES

- A. Electrical Tape:
 - 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
 - 5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
 - 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. American Polywater Corporation: www.polywater.com/#sle.
 - c. Ideal Industries, Inc: www.idealindustries.com/#sle.
- D. Cable Ties: Material and tensile strength rating suitable for application.
 - 1. Manufacturers:
 - a. Burndy LLC; _____: www.burndy.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage wire and cable has been completed.
- B. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- C. Verify that field measurements are as indicated.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 - 1. When circuit destination is indicated without specific routing, determine exact routing required.
 - 2. Arrange circuiting to minimize splices.
 - 3. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 - 4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 5. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- H. Terminate cables using suitable fittings.

1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- I. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- L. Make wiring connections using specified wiring connectors.
 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 3. Do not remove conductor strands to facilitate insertion into connector.
 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- P. Identify conductors and cables in accordance with Section 260553.
- Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- R. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect/Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical

- conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 260553.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

- b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
 3. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation; _____: www.cooperindustries.com/#sle.
 - b. Erico International Corporation; _____: www.erico.com/#sle.
 - c. O-Z/Gedney, a brand of Emerson Electric Co; _____: www.emerson.com/#sle.
 - C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
 - D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 1. Comply with MFMA-4.
 - E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
 - c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
 - d. Outlet Boxes: 1/4 inch (6 mm) diameter.
 - e. Luminaires: 1/4 inch (6 mm) diameter.
 - F. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 4. Hollow Masonry: Use toggle bolts.
 5. Hollow Stud Walls: Use toggle bolts.
 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 7. Sheet Metal: Use sheet metal screws.
 8. Wood: Use wood screws.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect/Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect/Engineer, do not provide support from roof deck.

- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners according to manufacturer's recommended torque settings.
- I. Remove temporary supports.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Flexible metal conduit (FMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Electrical metallic tubing (EMT).
- E. Conduit fittings.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- C. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- H. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- I. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- J. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- K. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).
- D. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).
- E. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- F. Exposed, Interior, Not Subject to Physical Damage: Use electrical metallic tubing (EMT).
- G. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
- H. Exposed, Exterior: Use galvanized steel rigid metal conduit.
- I. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
- J. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Motors.
- K. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Fittings for Grounding and Bonding: Also comply with Section 260526.
- C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 1/2 inch (16 mm) trade size.
- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
 - 2. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
 - 3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc; _____: www.afcweb.com/#sle.
 - 2. Electri-Flex Company; _____: www.electriflex.com/#sle.
 - 3. International Metal Hose; _____: www.metalhose.com/#sle.
- B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc; _____: www.afcweb.com/#sle.
 - 2. Electri-Flex Company; _____: www.electriflex.com/#sle.
 - 3. International Metal Hose; _____: www.metalhose.com/#sle.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

- c. Thomas & Betts Corporation: www.tnb.com/#sle.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.

2.06 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
 2. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
 3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 4. Connectors and Couplings: Use compression (gland) or set-screw type.
 5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Conduit Routing:
 1. When conduit destination is indicated without specific routing, determine exact routing required.
 2. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 3. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.

- c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - 4. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 5. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 6. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 - 7. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 - 8. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
- E. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 - 4. Use conduit strap to support single surface-mounted conduit.
 - 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 - 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 - 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
- F. Connections and Terminations:
 - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 - 3. Use suitable adapters where required to transition from one type of conduit to another.
 - 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 - 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 - 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 - 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- G. Penetrations:
 - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 - 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 - 4. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 - 5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 - 6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are

necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.

7. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- H. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where conduits are subject to earth movement by settlement or frost.
- I. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
 1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- J. Provide grounding and bonding in accordance with Section 260526.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

1.02 RELATED REQUIREMENTS

- A. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- D. Section 262726 - Wiring Devices:
 - 1. Wall plates.
 - 2. Additional requirements for locating boxes for wiring devices.
- E. Section 271000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 508A - UL Standard for Safety Industrial Control Panels; 2018.
- J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 - 3. Use suitable concrete type boxes where flush-mounted in concrete.
 - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 - 6. Use shallow boxes where required by the type of wall construction.
 - 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 - 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 - 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 - 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 - 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 - 12. Wall Plates: Comply with Section 262726.
 - 13. Manufacturers:
 - a. Hubbell Incorporated; Bell Products; _____: www.hubbell-rtb.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co; _____: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation; _____: www.tnb.com/#sle.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 - 2. NEMA 250 Environment Type, Unless Otherwise Indicated:

- a. Indoor Clean, Dry Locations: Type 1, painted steel.
- b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Box Locations:
 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
 2. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
 - b. Communications Systems Outlets: Comply with Section 271000.
 - c. _____.
 3. Locate boxes so that wall plates do not span different building finishes.
 4. Locate boxes so that wall plates do not cross masonry joints.
 5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 7. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 8. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
- E. Box Supports:
 1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

- F. Install boxes plumb and level.
- G. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- H. Install boxes as required to preserve insulation integrity.
- I. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- J. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- K. Close unused box openings.
- L. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- M. Provide grounding and bonding in accordance with Section 260526.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface raceway systems.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.
- C. UL 5A - Nonmetallic Surface Raceways and Fittings; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.04 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 RACEWAY REQUIREMENTS

- A. Provide all components, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.02 SURFACE RACEWAY SYSTEMS

- A. Manufacturers:
 - 1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
 - 2. MonoSystems, Inc; _____: www.monosystems.com/#sle.
 - 3. Wiremold, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.
- B. Surface Metal Raceways: Listed and labeled as complying with UL 5.
- C. Surface Nonmetallic Raceways: Listed and labeled as complying with UL 5A.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section 260573 - Power System Studies: Arc flash hazard warning labels.

1.03 REFERENCE STANDARDS

- A. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - b. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
 - 2. Arc Flash Hazard Warning Labels: Comply with Section 260573.
- C. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or

branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Manufacturers:
 - a. Brimar Industries, Inc: www.brimar.com/#sle.
 - b. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
 - c. Seton Identification Products; _____: www.seton.com/#sle.
2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
4. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:
 - a. Brady Corporation; _____: www.bradyid.com/#sle.
 - b. Brother International Corporation: www.brother-usa.com/#sle.
 - c. Panduit Corp: www.panduit.com/#sle.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend:
 - a. System designation where applicable:
 - 1) Emergency Power System: Identify with text "EMERGENCY".
 - 2) Fire Alarm System: Identify with text "FIRE ALARM".
 - b. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
 - a. System Designation: 1 inch (25 mm).
 - b. Equipment Designation: 1/2 inch (13 mm).
 - c. Other Information: 1/4 inch (6 mm).
5. Color:
 - a. Normal Power System: White text on black background.

2.03 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:
2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conductors and Cables: Legible from the point of access.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.

1.02 RELATED REQUIREMENTS

- A. Section 260529 - Hangers and Supports for Electrical Systems.
- B. Section 260533.16 - Boxes for Electrical Systems.
- C. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
 - 1. Includes finish requirements for wall controls specified in this section.
 - 2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Shop Drawings:
 - 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
- D. Field Quality Control Reports.
- E. Operation and Maintenance Data: Include detailed information on device programming and setup.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.07 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

- A. Manufacturers:
 - 1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
 - 2. Sensor Switch Inc; _____: www.sensorswitch.com/#sle.
 - 3. WattStopper; _____: www.wattstopper.com/#sle.
- B. All Occupancy Sensors:
 - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 - 2. Sensor Technology:
 - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
 - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
 - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
 - 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
 - 6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 - 7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
- C. Wall Switch Occupancy Sensors:
 - 1. All Wall Switch Occupancy Sensors:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

- c. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - d. Provide selectable audible alert to notify occupant of impending load turn-off.
 - e. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.
 2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
- D. Ceiling Mounted Occupancy Sensors:
 1. All Ceiling Mounted Occupancy Sensors:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 - b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
 - d. Finish: White unless otherwise indicated.
 2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
- E. Power Packs for Low Voltage Occupancy Sensors:
 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
 2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 3. Input Supply Voltage: Dual rated for 120/277 V ac.
 4. Load Rating: As required to control the load indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.

- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of lighting control devices provided under this section.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 262726.
- G. Provide required supports in accordance with Section 260529.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- I. Occupancy Sensor Locations:
 - 1. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- J. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
- K. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect/Engineer.
- C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 COMMISSIONING

- A. See Section 019113 - General Commissioning Requirements for commissioning requirements.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 260533.23 - Surface Raceways for Electrical Systems: Surface raceway systems, including multioutlet assemblies.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 260923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); 2017g.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- E. Provide GFCI protection for receptacles installed in kitchens.
- F. Provide GFCI protection for receptacles serving electric drinking fountains.

2.02 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with stainless steel wall plate.
- C. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

2.03 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
 - 2. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.
- B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
 - 2. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
 - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
 - 1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - 2. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.05 WALL PLATES

- A. Manufacturers:
 - 1. Hubbell Incorporated; _____: www.hubbell-wiring.com/#sle.
 - 2. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.
- B. Wall Plates: Comply with UL 514D.
 - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 - 2. Size: Standard; _____.
 - 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.

- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switches: 48 inches (1200 mm) above finished floor.
 - b. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 262813 - Fuses.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- E. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- F. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation; _____: www.eaton.com/#sle.
- B. Schneider Electric; Square D Products; _____: www.schneider-electric.us/#sle.
- C. Siemens Industry, Inc; _____: www.usa.siemens.com/#sle.
- D. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Minimum Ratings:
 - a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
- L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed switches plumb.

- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

3.02 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

PART 2 PRODUCTS

1.01 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

END OF SECTION

APPENDIX

- **Final Environmental Report at George Washington Elementary School**

FINAL REPORT OF ENVIRONMENTAL SERVICES

Performed at:

**GEORGE WASHINGTON ELEMENTARY SCHOOL
TOILET ROOM RENOVATIONS
100 ORCHARD SREET
WHITE PLAINS, NY 10604**

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. 31403019.000
Final Submission Date: February 19, 2021**



February 19, 2021

Mr. Frank Stefanelli
Director of Facilities
White Plains School District
508 North Street
White Plains, NY 10605

**Subject: Final Report of Environmental Services
George Washington Elementary School
Toilet Room Renovations
100 Orchard Street
White Plains, NY 10604**

Dear Mr. Stefanelli:

WSP USA Solutions, Inc. has completed a material inspection at the George Washington Elementary School located at 100 Orchard Street, White Plains, NY 10604. 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 Toilet Room Renovations project at the George Washington 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.

A handwritten signature in blue ink, appearing to read 'CN', is written over a light blue circular stamp.

Craig Napolitano, CHMM
Vice President, Hazmat & IH Services



TABLE OF CONTENTS

	Page
1.0 EXECUTIVE SUMMARY	1
2.0 FIELD INSPECTION PROCEDURES AND SAMPLE ANALYSIS METHODS.....	3
3.0 INSPECTION SCOPE AND MATERIAL ASSESSMENT.....	6
4.0 INSPECTION RESULTS	8
5.0 AREAS NOT ACCESSIBLE.....	11
6.0 CONCLUSIONS AND RECOMMENDATIONS.....	12
7.0 ASBESTOS ABATEMENT COST ESTIMATE	12
8.0 REPORT CERTIFICATIONS	13

Appendices

- Appendix A: Asbestos Sample Analysis Results in Tabular Form
- Appendix B: Asbestos Bulk Sample Field Data Sheets with Chain of Custody & Laboratory Results
- Appendix C: Asbestos Bulk Sample Location Drawings
- Appendix D: Asbestos Containing Materials Location Drawings
- Appendix E: Lead XRF Shot Results
- Appendix F: PCB Bulk Sample Field Data Sheets with Chain of Custody & Laboratory Results
- Appendix G: Company License, Personnel Certifications and Laboratory Accreditations
- Appendix H: Scope of Work Drawings
- Appendix I: Photographic Documentation
- Appendix J: File Search



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 George Washington Elementary School located at 100 Orchard Street, White Plains, NY 10604. The intent of this inspection was to screen for ACM, LBP and PCBs that may be impacted during the Toilet Room Renovations project at the George Washington Elementary School.

Nick Casale and Stephen Gruber of WSP performed this inspection on January 27, 2021 and February 17, 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-1207478-1). Mr. Gruber is licensed as a New York State Department of Labor (NYSDOL) Asbestos Inspector (Cert# 17-42557).

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 Toilet Room Renovations project at the George Washington Elementary School:

A. ASBESTOS-CONTAINING MATERIAL

Analytical results of the bulk samples collected on 01/27/2021 & 02/17/2021 by WSP indicate that the following materials **contain asbestos** (greater than 1-percent).

- **Pipe Insulation (Grey)**

The following materials **Contain Asbestos as per AHERA Report:**

- **Pipe Insulation**

Analytical results of the bulk samples collected on 01/27/2021 & 02/17/2021 by WSP indicate that the following materials **did not contain asbestos** (less than 1-percent);

- Sealant to Drain (Grey)
- Gypsum Board (White)
- Joint Compound to Gypsum Board (White)
- Glue to Baseboard (Yellow)
- Baseboard (Black)
- Textured Paint to Radiator (Brown)
- Fixture Caulk (White)
- Grout to Ceramic Tile at Urinal (White)
- Backing to Ceramic Tile at Urinal (White)
- Mortar to Interior Brick Wall (Gray)
- Firestop at Radiator Penetration (Tan)



The following materials **did not contain asbestos** as per AHERA Report:

- Wall Plaster, White Coat
- Wall Plaster, Brown Coat
- Ceiling Plaster, White Coat
- 2'x4' Fissured Ceiling Tile, White
- 2'x4' Gouged Ceiling Tile, White
- 2'x4' (2'x2' Design) Fissured Ceiling Tile, White
- 1'x1' Gouged Ceiling Tile, White
- 2'x4' Large Gouged Ceiling Tile, White
- 1'x1' Large Gouged Ceiling Tile, Beige
- 2'x4' Small Pinhole Ceiling Tile, White
- 1'x1' Large Pinhole Ceiling Tile, Beige
- 2'x4' Stripe Design Ceiling Tile, Beige
- 2'x4' (2'x2' Design) Gouged Ceiling Tile, White
- 2'x4' Smooth Ceiling Tile, White
- 1' x 1' Ceiling Tile
- Glue Dabs to 1' x 1' Ceiling Tile

B. LEAD-BASED PAINT

Based upon XRF readings, lead has been confirmed to exist in the following tested combinations:

- Cream Paint on Plaster Wall (Girls Bathroom 315)
- Cream Paint on Plaster Wall (Girls Bathroom 315)
- Cream Paint on Plaster Wall (Boys Bathroom 219)

Lead was **not detected** in the following tested combinations via XRF readings:

- Varnish Paint on Wood Door Frame (Girls Bathroom 315)
- Varnish Paint on Wood Door (Girls Bathroom 315)
- Red Paint on Metal Radiator (Girls Bathroom 315)
- White Paint on Metal Radiator Cover (Girls Bathroom 315)
- Varnish Paint on Wood Window Frame (Girls Bathroom 315)
- Red Paint on Plastic Stall Door (Girls Bathroom 315)
- White Paint on Plaster Ceiling (Girls Bathroom 315)
- Blue Paint on Plastic Stall Door (Boys Bathroom 321)
- Varnish Paint on Wood Door Frame (Boys Bathroom 219)
- Varnish Paint on Wood Door (Boys Bathroom 219)
- Blue Paint on Plastic Stall Door (Boys Bathroom 219)
- Cream Paint on Sheetrock Wall (Boys Bathroom 219)
- Brown Paint on Metal Window Sill (Boys Bathroom 219)
- White Paint on Wood Ceiling (Boys Bathroom 219)



- White Paint on Plaster Ceiling (Boys Bathroom 219)
- Cream Paint on Metal Electrical Conduit (Boys Bathroom 219)
- Cream Paint on Metal Vent Grill (Boys Bathroom 219)

C. PCB-CONTAINING MATERIAL

Analytical results of the bulk samples collected indicate that the following materials **contain PCB** (greater than 50 PPM):

- **None**

Analytical results of the bulk samples collected indicate that the following materials **did not contain PCB** (less than 50 PPM):

- Fixture Caulking (White)-Boys & Girls Bathrooms

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 than 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 Toilet Room Renovations project at the George Washington Elementary School. Locations surveyed include:

- Second Floor Girl's Toilet 215 & Boy's Toilet 219
- Third Floor Girl's Toilet 315 & Boy's Toilet 319

A. ASBESTOS-CONTAINING MATERIAL

Analytical results of the bulk samples collected on 01/27/2021 & 02/17/2021 by WSP indicate that the following materials **contain asbestos** (greater than 1-percent).

- **Pipe Insulation (Grey)**

The following materials **Contain Asbestos as per AHERA Report:**

- **Pipe Insulation**

Analytical results of the bulk samples collected on 01/27/2021 & 02/17/2021 by WSP indicate that the following materials **did not contain asbestos** (less than 1-percent);

- Sealant to Drain (Grey)
- Gypsum Board (White)
- Joint Compound to Gypsum Board (White)
- Glue to Baseboard (Yellow)
- Baseboard (Black)
- Textured Paint to Radiator (Brown)
- Fixture Caulk (White)
- Grout to Ceramic Tile at Urinal (White)
- Backing to Ceramic Tile at Urinal (White)
- Mortar to Interior Brick Wall (Gray)
- Firestop at Radiator Penetration (Tan)

The following materials **did not contain asbestos as per AHERA Report:**

- Wall Plaster, White Coat
- Wall Plaster, Brown Coat
- Ceiling Plaster, White Coat
- 2'x4' Fissured Ceiling Tile, White
- 2'x4' Gouged Ceiling Tile, White
- 2'x4' (2'x2' Design) Fissured Ceiling Tile, White
- 1'x1' Gouged Ceiling Tile, White
- 2'x4' Large Gouged Ceiling Tile, White



- 1'x1' Large Gouged Ceiling Tile, Beige
- 2'x4' Small Pinhole Ceiling Tile, White
- 1'x1' Large Pinhole Ceiling Tile, Beige
- 2'x4' Stripe Design Ceiling Tile, Beige
- 2'x4' (2'x2' Design) Gouged Ceiling Tile, White
- 2'x4' Smooth Ceiling Tile, White
- 1' x 1' Ceiling Tile
- Glue Dabs to 1' x 1' Ceiling Tile

B. LEAD-BASED PAINT

Based upon XRF readings, lead has been confirmed to exist in the following tested combinations:

- **Cream Paint on Plaster Wall (Girls Bathroom 315)**
- **Cream Paint on Plaster Wall (Girls Bathroom 315)**
- **Cream Paint on Plaster Wall (Boys Bathroom 219)**

Lead was **not detected** in the following tested combinations via XRF readings:

- Varnish Paint on Wood Door Frame (Girls Bathroom 315)
- Varnish Paint on Wood Door (Girls Bathroom 315)
- Red Paint on Metal Radiator (Girls Bathroom 315)
- White Paint on Metal Radiator Cover (Girls Bathroom 315)
- Varnish Paint on Wood Window Frame (Girls Bathroom 315)
- Red Paint on Plastic Stall Door (Girls Bathroom 315)
- White Paint on Plaster Ceiling (Girls Bathroom 315)
- Blue Paint on Plastic Stall Door (Boys Bathroom 321)
- Varnish Paint on Wood Door Frame (Boys Bathroom 219)
- Varnish Paint on Wood Door (Boys Bathroom 219)
- Blue Paint on Plastic Stall Door (Boys Bathroom 219)
- Cream Paint on Sheetrock Wall (Boys Bathroom 219)
- Brown Paint on Metal Window Sill (Boys Bathroom 219)
- White Paint on Wood Ceiling (Boys Bathroom 219)
- White Paint on Plaster Ceiling (Boys Bathroom 219)
- Cream Paint on Metal Electrical Conduit (Boys Bathroom 219)
- Cream Paint on Metal Vent Grill (Boys Bathroom 219)

D. PCB-CONTAINING MATERIAL

Analytical results of the bulk samples collected indicate that the following materials **contain PCB** (greater than 50 PPM):

- **None**



Final Report for Environmental Inspection Services

Analytical results of the bulk samples collected indicate that the following materials **did not contain PCB** (less than 50 PPM):

- Fixture Caulking (White)-Boys & Girls Bathrooms

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 Toilet Room Renovations project at the George Washington 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 01/27/2021			
A	Boys Room 219	Sealant to Drain (Grey)	<1% Anthophyllite
B	Boys Room 219	Gypsum Board (White)	NAD
C	Boys Room 219	Joint Compound to Gypsum Board (White)	NAD
D	Boys Room 219	Glue to Baseboard (Yellow)	NAD
E	Boys Room 219	Baseboard (Black)	NAD
F	Girls Room 315, Girls Room 215	Textured Paint to Radiator (Brown)	NAD
G	Boys Room 219, Boys Room 319	Fixture Caulk (White)	NAD
H	Boys Room 319, Boys Room 219	Grout to Ceramic Tile at Urinal (White)	NAD
I	Boys Room 319, Boys Room 219	Backing to Ceramic Tile at Urinal (White)	NAD
J	3 rd Floor Hallway, 2 nd Floor Hallway	Mortar to Interior Brick Wall (Gray)	NAD
K	Girls 315 Bathroom, Boys Room 219	Firestop at Radiator Penetration (Tan)	NAD
WSP Sampled on 02/17/2021			
L	Girls 315 Bathroom, Boys Room 219	Pipe Insulation (Grey)	44.00% Chrysotile
AHERA Report			
-	Throughout	Pipe Insulation (Concealed inside Chase)	ACM
-	Throughout	Wall Plaster, White Coat	NAD
-	Throughout	Wall Plaster, Brown Coat	NAD
-	Throughout	Ceiling Plaster, White Coat	NAD



HOMOGENOUS MATERIAL	LOCATION	MATERIAL	ASBESTOS CONTENT
-	Throughout	2’x4’ Fissured Ceiling Tile, White	NAD
-	Throughout	2’x4’ Gouged Ceiling Tile, White	NAD
-	Throughout	2’x4’ (2’x2’ Design) Fissured Ceiling Tile, White	NAD
-	Throughout	1’x1’ Gouged Ceiling Tile, White	NAD
-	Throughout	2’x4’ Large Gouged Ceiling Tile, White	NAD
-	Throughout	1’x1’ Large Gouged Ceiling Tile, Beige	NAD
-	Throughout	2’x4’ Small Pinhole Ceiling Tile, White	NAD
-	Throughout	1’x1’ Large Pinhole Ceiling Tile, Beige	NAD
-	Throughout	2’x4’ Stripe Design Ceiling Tile, Beige	NAD
-	Throughout	2’x4’ (2’x2’ Design) Gouged Ceiling Tile, White	NAD
-	Throughout	2’x4’ Smooth Ceiling Tile, White	NAD
-	Throughout	1’ x 1’ Ceiling Tile	NAD
-	Throughout	Glue Dabs to 1’ x 1’ Ceiling Tile	NAD

Bold = Positive for ACM NAD = No Asbestos Detected NA/PS = Not analyzed/ positive sample

4.2 CONDITION AND FRIABILITY 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
Second Floor Girl’s Toilet 215 & Boy’s Toilet 219 and Third Floor Girl’s Toilet 315 & Boy’s Toilet 319	Pipe Insulation (Grey) - Concealed inside Chase	225 LF	Friable	Fair

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.



Final Report for Environmental Inspection Services

B. LEAD-BASED PAINT

The lead Inspection involved a thorough visual examination of all accessible areas impacted by the proposed Toilet Room Renovations project at the George Washington Elementary School. The following suspect surfaces were tested for lead content:

Test Number	Sample Location	Building Component	Color	Substrate	Condition	Lead Content (mg/cm ²)
1	Calibration Check @ 1.0	---	---	---	---	1.0
2	Calibration Check @ 1.0	---	---	---	---	1.0
3	Calibration Check @ 1.0	---	---	---	---	1.0
4	Calibration Check @ 0.0	---	---	---	---	0.0
5	Calibration Check @ 0.0	---	---	---	---	0.0
6	Calibration Check @ 0.0	---	---	---	---	0.0
7	Girls Bathroom 315	Door Frame	Varnish	Wood	Fair	0.0
8	Girls Bathroom 315	Door	Varnish	Wood	Fair	0.0
9	Girls Bathroom 315	Wall	Cream	Plaster	Fair	2.7
10	Girls Bathroom 315	Wall	Cream	Plaster	Fair	2.8
11	Girls Bathroom 315	Radiator	Red	Metal	Fair	0.4
12	Girls Bathroom 315	Radiator Cover	White	Metal	Fair	0.0
13	Girls Bathroom 315	Window Frame	Varnish	Wood	Fair	0.0
14	Girls Bathroom 315	Stall Door	Red	Plastic	Fair	0.2
15	Girls Bathroom 315	Ceiling	White	Plaster	Fair	0.1
16	Boys Bathroom 321	Stall Door	Blue	Plastic	Fair	0.2
17	Boys Bathroom 219	Door Frame	Varnish	Wood	Fair	0.0
18	Boys Bathroom 219	Door	Varnish	Wood	Fair	-0.2
19	Boys Bathroom 219	Wall	Cream	Plaster	Fair	3.8
20	Boys Bathroom 219	Stall Door	Blue	Plastic	Fair	0.2
21	Boys Bathroom 219	Wall	Cream	Sheetrock	Fair	0.1
22	Boys Bathroom 219	Window Sill	Brown	Metal	Fair	0.1
23	Boys Bathroom 219	Ceiling	White	Wood	Fair	0.0
24	Boys Bathroom 219	Ceiling	White	Plaster	Fair	0.1
25	Boys Bathroom 219	Electrical Conduit	Cream	Metal	Fair	-0.1
26	Boys Bathroom 219	Vent Grill	Cream	Metal	Fair	0.1



Final Report for Environmental Inspection Services

Test Number	Sample Location	Building Component	Color	Substrate	Condition	Lead Content (mg/cm2)
27	Calibration Check @ 1.0	---	---	---	---	1.0
28	Calibration Check @ 1.0	---	---	---	---	1.1
29	Calibration Check @ 1.0	---	---	---	---	1.0
30	Calibration Check @ 0.0	---	---	---	---	0.1
31	Calibration Check @ 0.0	---	---	---	---	0.0
32	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 Toilet Room Renovations project at the George Washington Elementary School. The following suspect materials were tested for PCB content:

HOMOGENOUS MATERIAL	LOCATION	MATERIAL	PCB CONTENT (PPM)
A	Girls Room 215, Boys Room 219, Girls Room 315	Fixture Caulking (White)	1.0

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

ACM & LBP have been identified in this inspection that may be impacted as part of the proposed Toilet Room Renovations project at the George Washington Elementary School.

No PCB was identified in this inspection that may be impacted as part of the proposed Toilet Room Renovations project at the George Washington Elementary School.

The ACM, LBP & PCB inspection was conducted at the request of White Plains School District for the proposed Toilet Room Renovations project at the George Washington 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

This cost estimate is based on compliance with Industrial Code Rule 56 (12 NYCRR Part 56), standard industry practices and projects of similar type and complexity. Performing the work in stages or phases, rather than as one continuous process may result in additional mobilization costs. The following factors have been considered:

This cost estimate is exclusively limited to the Toilet Room Renovations project at the George Washington Elementary School. Any alteration to the scope of work will require further investigation and may affect the cost estimate presented.

Location	Material Description / Color	Quantity	Unit Rate	Total
Second Floor Girl's Toilet 215 & Boy's Toilet 219 and Third Floor Girl's Toilet 315 & Boy's Toilet 319	Pipe Insulation (Grey) - Concealed inside Chase	225 SF	\$25.00/SF	\$5,625.00
Subtotal				\$5,625.00
Mobilization				\$1,000.00
Total				\$6,625.00

SF = Square Feet

LF = Linear Feet



Final Report for Environmental Inspection Services

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 George Washington Elementary School, Toilet Room Renovations 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, Hazmat & IH Services



**APPENDIX A:
ASBESTOS SAMPLE ANALYSIS RESULTS IN TABULAR FORM**



Final Report for Environmental Inspection Services

APPENDIX A SAMPLE ANALYSIS RESULTS IN TABULAR FORM GEORGE WASHINGTON ELEMENTARY SCHOOL TOILET ROOM RENOVATIONS 100 ORCHARD STREET WHITE PLAINS, NY 10604

Homogeneous Area No.	Sample No.	Location	Material	PLM Result	TEM Result
WSP Sampled on 01/27/2021					
A	01	Boys Room 219	Sealant to Drain (Grey)	<1% Anthophyllite	<1% Anthophyllite
	02	Boys Room 219		<1% Anthophyllite	<1% Anthophyllite
B	03	Boys Room 219	Gypsum Board (White)	NAD	N/A
	04	Boys Room 219		NAD	N/A
C	05	Boys Room 219	Joint Compound to Gypsum Board (White)	NAD	N/A
	06	Boys Room 219		NAD	N/A
D	07	Boys Room 219	Glue to Baseboard (Yellow)	NAD	NAD
	08	Boys Room 219		NAD	NAD
E	09	Boys Room 219	Baseboard (Black)	NAD	NAD
	10	Boys Room 219		NAD	NAD
F	11	Girls Room 315	Textured Paint to Radiator (Brown)	NAD	NAD
	12	Girls Room 215		NAD	NAD
G	13	Boys Room 219	Fixture Caulk (White)	NAD	NAD
	14	Boys Room 319		NAD	NAD
H	15	Boys Room 319	Grout to Ceramic Tile at Urinal (White)	NAD	N/A
	16	Boys Room 219		NAD	N/A
I	17	Boys Room 319	Backing to Ceramic Tile at Urinal (White)	NAD	N/A
	18	Boys Room 219		NAD	N/A
J	19	3 rd Floor Hallway	Mortar to Interior Brick Wall (Gray)	NAD	N/A
	20	2 nd Floor Hallway		NAD	N/A
K	21	Girls 315 Bathroom	Firestop at Radiator Penetration (Tan)	NAD	N/A
	22	Boys Room 219		NAD	N/A

Bold = Positive for ACM
NAD = No Asbestos Detected

N/A = Not Applicable
NA/PS = Not analyzed/ positive sample



Final Report for Environmental Inspection Services

Homogeneous Area No.	Sample No.	Location	Material	PLM Result	TEM Result
WSP Sampled on 02/17/2021					
L	23	Girls 315 Bathroom	Pipe Insulation (Grey)	44.00% Chrysotile	N/A
	24	Boys Room 219		NA/PS	N/A
	25	Boys Room 219		NA/PS	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: 032101226
Customer ID: LBAP78
Customer PO: 314029560000200
Project ID:

Attention: Alex Smolyar
WSP USA Solutions Inc
96 Morton Street
8th floor
New York, NY 10014
Project: 31402956.000.02.00/ WHITE PLAINS/ GEORGE WASHINGTON ELEMENTARY SCHOOL/ BATHROOMS

Phone: (212) 612-7900
Fax:
Received Date: 01/27/2021 3:34 PM
Analysis Date: 01/27/2021 - 01/28/2021
Collected Date: 01/27/2021

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1 032101226-0001			Description BOY'S ROOM 219 - SEALANT TO DRAIN (GREY)		
			Homogeneity Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/28/2021	Gray	1.40% Fibrous (other)	98.60% Other	Inconclusive : <1% Anthophyllite
TEM NYS 198.4 NOB	01/28/2021	Gray	None	100.00% Other	<1% Anthophyllite
Sample ID 2 032101226-0002			Description BOY'S ROOM 219 - SEALANT TO DRAIN (GREY)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/28/2021	Gray	1.20% Fibrous (other)	98.80% Other	Inconclusive : <1% Anthophyllite
TEM NYS 198.4 NOB	01/28/2021	Gray	None	100.00% Other	<1% Anthophyllite
Sample ID 3 032101226-0003			Description BOY'S ROOM 219 - GYPSUM BOARD (WHITE)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	Brown/ Gray	5.00% Cellulose 5.00% Glass	45.00% Gypsum 45.00% Non-fibrous (other)	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 4 032101226-0004			Description BOY'S ROOM 219 - GYPSUM BOARD (WHITE)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	Brown/ Gray	10.00% Cellulose 1.00% Glass	10.00% Ca Carbonate 55.00% Gypsum 24.00% Non-fibrous (other)	None Detected
Inseparable paint / coating layer included in analysis					
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 5 032101226-0005			Description BOY'S ROOM 219 - JOINT COMPOUND TO GYP. (WHITE)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	White		30.00% Ca Carbonate 5.00% Mica 65.00% Non-fibrous (other)	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: 01/28/2021 11:22:25



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: 032101226

Customer ID: LBAP78

Customer PO: 314029560000200

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 6 032101226-0006			Description BOY'S ROOM 219 - JOINT COMPOUND TO GYP. (WHITE)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	Tan/ White		50.00% Ca Carbonate 50.00% Non-fibrous (other)	None Detected
Inseparable paint / coating layer included in analysis					
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 7 032101226-0007			Description BOY'S ROOM 219 - GLUE TO BASEBOARD (YELLOW)		
			Homogeneity Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/28/2021	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/28/2021	Yellow		100.00% Other	None Detected
Sample ID 8 032101226-0008			Description BOY'S ROOM 219 - GLUE TO BASEBOARD (YELLOW)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/28/2021	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/28/2021	Yellow		100.00% Other	None Detected
Sample ID 9 032101226-0009			Description BOY'S ROOM 219 - BASEBOARD (BLACK)		
			Homogeneity Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/28/2021	Black		100.00% Other	Inconclusive: None Detected
Final residue mass <1%,					
TEM NYS 198.4 NOB	01/28/2021	Black		100.00% Other	None Detected
Sample ID 10 032101226-0010			Description BOY'S ROOM 219 - BASEBOARD (BLACK)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/28/2021	Black		100.00% Other	Inconclusive: None Detected
Final residue mass <1%,					
TEM NYS 198.4 NOB	01/28/2021	Black		100.00% Other	None Detected
Sample ID 11 032101226-0011			Description GIRLS ROOM 315 - TEXTURED PAINT TO RADIATOR (BROWN)		
			Homogeneity Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/28/2021	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/28/2021	Brown		100.00% Other	None Detected

Initial report from: 01/28/2021 11:22:25



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: 032101226

Customer ID: LBAP78

Customer PO: 314029560000200

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 12 032101226-0012			Description GIRLS ROOM 215 - TEXTURED PAINT TO RADIATOR (BROWN)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/28/2021	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/28/2021	Brown		100.00% Other	None Detected
Sample ID 13 032101226-0013			Description BOYS ROOM 219 - FIXTURE CAULK (WHITE)		
			Homogeneity Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/28/2021	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/28/2021	White		100.00% Other	None Detected
Sample ID 14 032101226-0014			Description BOYS ROOM 319 - FIXTURE CAULK (WHITE)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/28/2021	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/28/2021	White		100.00% Other	None Detected
Sample ID 15 032101226-0015			Description BOYS ROOM 319 - GROUT TO CERAMIC TILE AT URINAL (WHITE)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	Gray/ White		55.00% Ca Carbonate 15.00% Gypsum 30.00% Non-fibrous (other)	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 16 032101226-0016			Description BOYS ROOM 219 - GROUT TO CERAMIC TILE AT URINAL (WHITE)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	White		35.00% Ca Carbonate 65.00% Non-fibrous (other)	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 17 032101226-0017			Description BOYS ROOM 319 - BACKING TO CERAMIC TILE AT URINAL (WHITE)		
			Homogeneity Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	Gray		20.00% Ca Carbonate 6.00% Mica 19.00% Non-fibrous (other) 55.00% 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: 01/28/2021 11:22:25



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: 032101226

Customer ID: LBAP78

Customer PO: 314029560000200

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 18 032101226-0018		Description	BOYS ROOM 219 - BACKING TO CERAMIC TILE AT URINAL (WHITE)		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	Gray		20.00% Ca Carbonate 35.00% Non-fibrous (other) 45.00% 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 19 032101226-0019		Description	HALLWAY 3RD FL - MORTAR TO INTERIOR BRICK WALL (GRAY)		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	Brown		40.00% Ca Carbonate 60.00% Non-fibrous (other)	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 20 032101226-0020		Description	HALLWAY 2ND FL - MORTAR TO INTERIOR BRICK WALL (GRAY)		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	Brown		30.00% Ca Carbonate 70.00% Non-fibrous (other)	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 21 032101226-0021		Description	GIRLS 315 BATHROOM - FIRESTOP AT RADIATOR PENETRATION (TAN)		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	Gray/ Tan		20.00% Ca Carbonate 5.00% Mica 35.00% Non-fibrous (other) 40.00% 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 22 032101226-0022		Description	BOYS ROOM 219 - FIRESTOP AT RADIATOR PENETRATION (TAN)		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/27/2021	Gray		20.00% Ca Carbonate 40.00% Non-fibrous (other) 40.00% 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: 01/28/2021 11:22:25



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: 032101226
Customer ID: LBAP78
Customer PO: 314029560000200
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: 1/27/2021
Analysis Completed Date: 1/28/2021

Sample Receipt Time: 3:34 PM
Analysis Completed Time: 5:13 AM

Analyst(s):

Christopher Cernansky PLM NYS 198.1 Friable (6)

Ghaly Hemaya PLM NYS 198.1 Friable (6)

Ghaly Hemaya PLM NYS 198.6 NOB (10)

Hongyan Ran TEM NYS 198.4 NOB (10)

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: 01/28/2021 11:22:25



ASBESTOS SURVEY DATA SHEET/ CHAIN OF CUSTODY

Order ID: 032101226

PROJECT NO.: 314 02956 .000.02.00
CLIENT: White Plains
PROJECT SITE: George Washington Elementary School
Project Manager: A. Smolyar

LOCATION(S) SURVEYED: Bathrooms
PROPOSED PROJECT:
DATE(S) OF INSPECTION: 1.27.2021
Inspector(s): N. Casale / S. Gruber

032101220

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	Sealant to Drain Boys Room 219	Sealant to Drain (Grey)		
↓	2	↓	↓		
B	3	Boys Room 219	Gypsum Board (white)		
↓	4	↓	↓		
C	5	Boys Room 219	Joint Compound to Gyp. (white)		
↓	6	↓	↓		
D	7	Boys Room 219	Composite Glue to Baseboard (Yellow)		Composite Sample
↓	8	↓	↓		
E	9	↓	Baseboard (Black)		
↓	10	↓	↓		
F	11	Girls Room 315	Textured Paint to Radiator		
↓	12	Girls Room 215	(Brown)		

21 JAN 27 11:34
 EMSL MANHATTAN LAB
 RECEIVED

CHAIN OF CUSTODY

Relinquished by: (print) J. Wang	(Sign)	1/27/21	3:25 AM/PM	Relinquished by: (print)	(Sign)	/ /	AM/PM	Relinquished by: (print)	(Sign)	/ /	AM/PM
Received by: (print) Cleah Ramani	(Sign)	1/27/21	3:34 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

Page 1 of 2



ASBESTOS SURVEY DATA SHEET/ CHAIN OF CUSTODY

PAGE 2 OF 2

Order ID: 032101226

PROJECT NO.: 31402956.000.02.00

CLIENT: White Plains

PROJECT SITE: George Washington ES

Project Manager: A. Smolyar

LOCATION(S) SURVEYED: Bathrooms

PROPOSED PROJECT:

DATE(S) OF INSPECTION: 1/27/2021

Inspector(s): N. Casale, S. Gruber

0321012260

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
G	13	Boys Room 219	Fixture Caulk (White)		
↓	14	Boys Room 319	↓		
H	15	Boys Room 319	Grout to Ceramic Tile at Urinal		
↓	16	Boys Room 219	(White)		
I	17	Boys Room 319	Backing to Ceramic Tile		
↓	18	Boys Room 219	at urinal (White)		
J	19	Hallway 3rd FL	Mortar to Interior Brick Wall		
↓	20	Hallway 2nd FL	(Gray)		
K	21	Girls 315 Bathroom	Firestop at Radiator Penetration		
↓	22	Boys Room 219	(Tan)		

 21 JAN 27 PM 3:34
 EMSL MANHATTAN LAB RECEIVED

CHAIN OF CUSTODY

Relinquished by: (print) J. Wong, S. Gruber	(Sign)	1/27/21	3:27 AM/PM	Relinquished by: (print)	(Sign)	/ /	AM/PM	Relinquished by: (print)	(Sign)	/ /	AM/PM
Received by: (print) Alan Roman	(Sign)	1/27/21	3:34 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

Page 2 of 2



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: 032102379
Customer ID: LBAP78
Customer PO: 314030190000200
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: 02/17/2021 3:14 PM
Analysis Date: 02/18/2021
Collected Date: 02/17/2021
Project: 31403019.000.02.00/ WHITE PLAINS CITY SCHOOL DISTRICT/ 100 ORCHARD ST. WHITE PLAINS, NY 10604/ GEORGE WASHINGTON SCHOOL

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 23 032102379-0001			Description GIRLS BATHROOM 315 - PIPE INSULATION (GREY) Homogeneity Homogeneous		
PLM NYS 198.1 Friable	02/18/2021	Gray	15.00% Cellulose	41.00% Non-fibrous (other)	44.00% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 24 032102379-0002			Description BOYS BATHROOM 219 - PIPE INSULATION (GREY) Homogeneity		
PLM NYS 198.1 Friable	02/18/2021				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 25 032102379-0003			Description BOYS BATHROOM 219 - PIPE INSULATION (GREY) Homogeneity		
PLM NYS 198.1 Friable	02/18/2021				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 02/18/2021 13:20:57



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: 032102379
Customer ID: LBAP78
Customer PO: 314030190000200
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: 2/17/2021
 Analysis Completed Date: 2/18/2021

Sample Receipt Time: 3:14 PM
 Analysis Completed Time: 1:01 AM

Analyst(s):

Laura Harris PLM NYS 198.1 Friable (1)

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

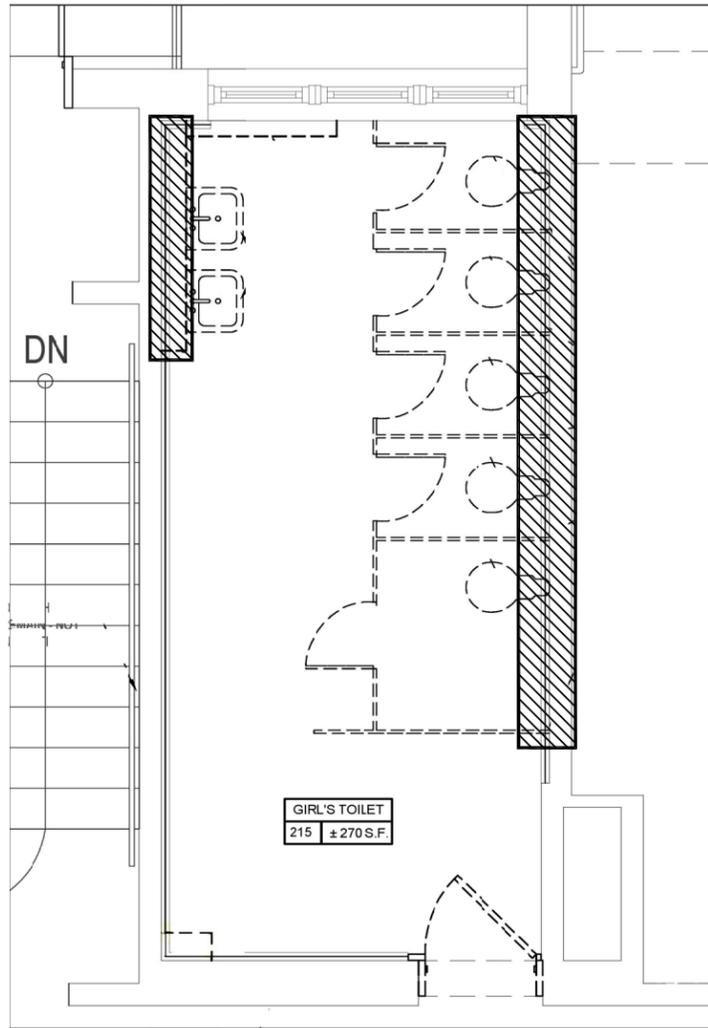
Initial report from: 02/18/2021 13:20:57



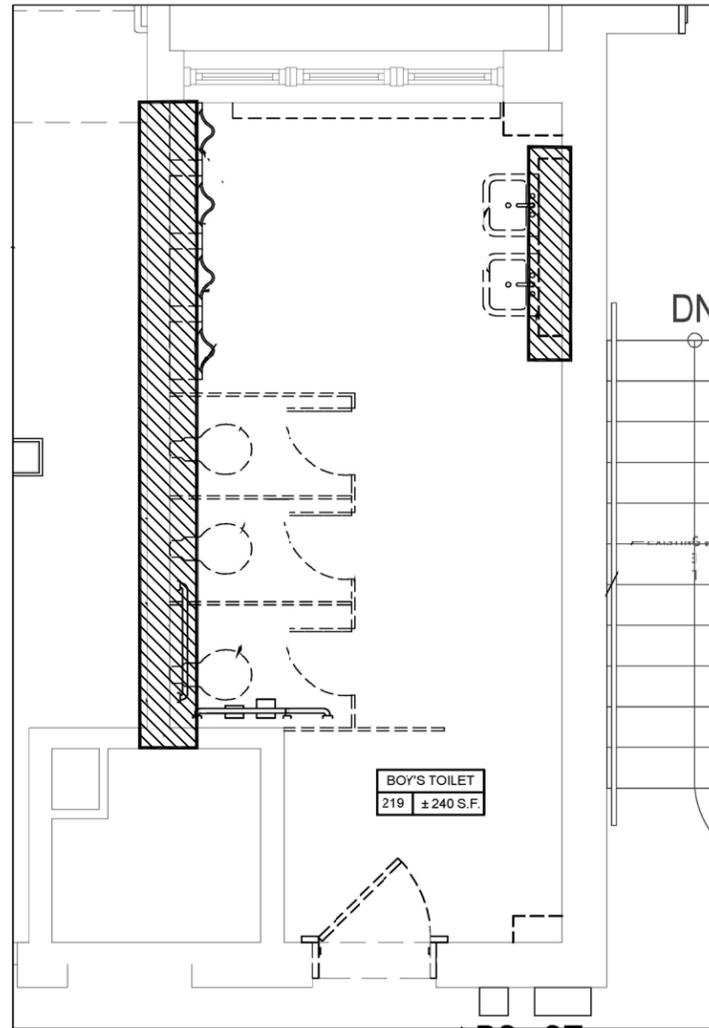
**APPENDIX C:
ASBESTOS BULK SAMPLE LOCATION DRAWINGS**



**APPENDIX D:
ASBESTOS CONTAINING MATERIALS LOCATION
DRAWINGS**

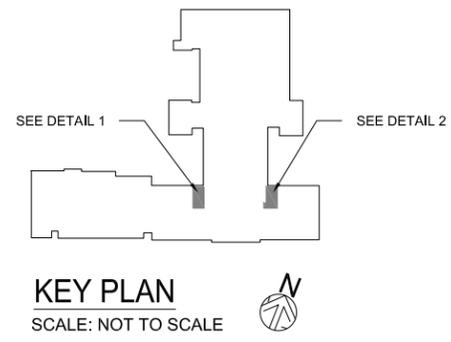


1 215 GIRLS' TOILET PLAN - SECOND FLOOR - DETAIL 1
ACM001 SCALE: NOT TO SCALE



1 219 BOYS' TOILET PLAN - SECOND FLOOR - DETAIL 2
ACM001 SCALE: NOT TO SCALE

LEGEND
 LOCATION OF ASBESTOS CONTAINING PIPE INSULATION (CONCEALED INSIDE CHASE)



CONSULTANTS: ENVIRONMENTAL CONSULTANT

 WSP USA SOLUTIONS
 500 SUMMIT ROAD, SUITE 450
 VALHALLA, NY 10595
 TELEPHONE: 914.742.1120

MARK	DATE	DESCRIPTION

DESIGNED BY: XX DRAWN BY: JP CHECKED BY: AS REVIEWED BY: CN
 PROJECT NO.: 31403018,000 DATE: FEBRUARY 2021 SCALE: AS SHOWN

CLIENT
**Toilet Room Renovations at
 The George Washington
 Elementary school**

**Interior Upgrades and Site
 Work at White Plains High
 School**



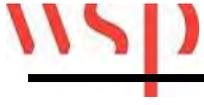
**100 Orchard Street
 White Plains, NY 10604**

CONTRACT
 STATUS

SHEET TITLE
**ASBESTOS CONTAINING
 MATERIALS
 GIRLS'S TOILETS AND BOYS
 TOILETS FLOOR PLANS
 2ND AND 3RD FLOOR**

DRAWING NO.
ACM001

Z:\WORK\2021\02\31403018\000\ACM001-1.dwg - GEORGE W. WASHINGTON ELEMENTARY SCHOOL DISTRICT 12/28/2021 10:00 AM



**APPENDIX E:
LEAD XRF SHOT RESULTS**

WSP

XRF CALIBRATION CHECK FORMPAGE 1 OF 2

PROJ. NO.:

DATE: 1/27/21

PROJECT NAME:

INSPECTOR NAME: N. CasaleCLIENT: White PlainsINSPECTOR SIGNATURE: [Signature]SITE: George Washington

PROJ. MANAGER:

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

_____ mg/cm ² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME: _____	TEST #	<u>1</u>	<u>2</u>	<u>3</u>	
	XRF READING	<u>1.0</u>	<u>1.0</u>	<u>1.0</u>	

CALIBRATION CHECK - PRIOR TO LEAVING OFFICE

_____ mg/cm ² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME: _____	TEST #	<u>4</u>	<u>5</u>	<u>6</u>	
	XRF READING	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	

CALIBRATION CHECK - FIELD-STARTField End

_____ mg/cm ² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME: _____	TEST #	<u>27</u>	<u>28</u>	<u>29</u>	
	XRF READING	<u>1.0</u>	<u>1.1</u>	<u>1.0</u>	

CALIBRATION CHECK - ~~FIELD-END~~ 2-HR (circle one)

_____ mg/cm ² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME: _____	TEST #	<u>30</u>	<u>31</u>	<u>32</u>	
	XRF READING	<u>0.1</u>	<u>0.0</u>	<u>0.0</u>	

CALIBRATION CHECK - FIELD-END/2-HR (circle one)

_____ mg/cm ² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME: _____	TEST #				
	XRF READING				

CALIBRATION CHECK - FIELD-END/2-HR (circle one)

_____ mg/cm ² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME: _____	TEST #				
	XRF READING				

CALIBRATION CHECK - FIELD-END/2-HR (circle one)

_____ mg/cm ² Calibration Block		FIRST READING	SECOND READING	THIRD READING	AVERAGE
CALIBRATION TIME: _____	TEST #				
	XRF READING				

XRF LEAD-BASED PAINT TESTING DATA SHEET/CHAIN OF CUSTODY

PROJECT NO.: _____ PROJECT NAME: _____ XRF SERIAL #: RMD-2456
 CLIENT: _____ PROJECT LOCATION: _____
 INSPECTOR(S): _____ INSPECTION DATE: _____
 PROJ. MANAGER: _____

SPACE CHARACTERISTICS: FLOOR #: _____ ROOM #: _____ ROOM NAME: _____
 NOTES: _____

SAMPLE #	SUBSTRATE	COMPONENT DESCRIPTION										XRF READING [mg/cm ²]	
		COLOR	CONDITION [I/F/P]	COMPONENT	WALL/SIDE DESIGN.	SIDE [L/C/R]	HEIGHT [L/M/U]	COMPONENT REPLACENT	QUANTITY (IF POSITIVE) [SF]	PHOTO	NOTES (DETERIORATION TO FRICTION/IMPACT AND/OR MOISTURE?)		
7	M PL S C CB PG CR B (W) V CT G FG OTHER:	Varnish		DF	(A) B C D RM CTR FL CL							Girls Bath - Room 315	0.0
8	M PL S C CB PG CR B (W) V CT G FG OTHER:	Varnish		Door	(A) B C D RM CTR FL CL							315	0.0
9	M PL S C CB PG CR B W V CT G FG OTHER:	Cream		Wall	(A) B C D RM CTR FL CL							315	2.7
10	M PL S C CB PG CR B W V CT G FG OTHER:	Cream		Wall	(A) B C D RM CTR FL CL							315	2.8
11	M PL S C CB PG CR B W V CT G FG OTHER:	Red		Radiator	A B C D RM CTR FL CL							315	0.4
12	M PL S C CB PG CR B W V CT G FG OTHER:	White		Rad. Cover	A B C D RM CTR FL CL							315	0.0
13	M PL S C CB PG CR B (W) V CT G FG OTHER:	Varnish		Window Frame	A B C D RM CTR FL CL							315	0.0
14	M PL S C CB PG CR B W V CT G FG OTHER: Plastic	Red		Stall DR	A B C D RM CTR FL CL							315	0.2
15	M PL S C CB PG CR B W V CT G FG OTHER:	White		Ceiling	A B C D RM CTR FL CL							315	0.1
16	M PL S C CB PG CR B W V CT G FG OTHER: Plastic	Blue		Stall Door	A B C D RM CTR FL CL							Boys Bath Room 321	0.2
17	M PL S C CB PG CR B (W) V CT G FG OTHER:	Varnish		DF	(A) B C D RM CTR FL CL							Boys Bath Room 219	0.0
18	M PL S C CB PG CR B (W) V CT G FG OTHER:	Varnish		DR	(A) B C D RM CTR FL CL							219	-0.2
19	M PL S C CB PG CR B W V CT G FG OTHER:	Cream		Wall	(A) B C D RM CTR FL CL							219	3.8
20	M PL S C CB PG CR B W V CT G FG OTHER: Plastic	Blue		Stall DR	A B C D RM CTR FL CL							219	0.2
21	M PL S C CB PG CR B W V CT G FG OTHER:	Cream		Wall	A B C D RM CTR FL CL							219	0.1
22	M PL S C CB PG CR B (W) V CT G FG OTHER:	Window Sill		Brown Varnish	A B C D RM CTR FL CL							219	0.1
23	M PL S C CB PG CR B (W) V CT G FG OTHER:	White		Ceiling	A B C D RM CTR FL CL							219	0.0
24	M PL S C CB PG CR B W V CT G FG OTHER:	White		Ceiling	A B C D RM CTR FL CL							219	0.1
25	M PL S C CB PG CR B W V CT G FG OTHER:	Cream		Elec. Conduit	A B C D RM CTR FL CL							219	+0.1

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;

26 M Cream Vent Grill A 219 0.1



**APPENDIX F:
PCB BULK SAMPLE FIELD DATA SHEETS WITH CHAIN OF
CUSTODY & LABORATORY RESULTS**



EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077

Phone: (856) 303-2500 Fax: (856) 858-4571 Email: EnvChemistry2@emsl.com

Attn:

**Nicholas Casale
WSP USA Solutions Inc
96 Morton Street
8th floor
New York, NY 10014**

2/4/2021

Phone: (212) 612-7900
Fax:

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 1/28/2021. The results are tabulated on the attached data pages for the following client designated project:

31402956.000.02.00

The reference number for these samples is EMSL Order #012100845. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Approved By:

Phillip Worby, Environmental Chemistry
Laboratory Director



The test results contained within this report meet the requirements of NELAP and/or the specific certification program that is applicable, unless otherwise noted.
NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, CA ELAP 1877

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the NELAP, unless specifically indicated. All results for soil samples are reported on a dry weight basis, unless otherwise noted. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (856) 303-2500 / (856) 858-4571

<http://www.EMSL.com>EnvChemistry2@emsl.com

EMSL Order: 012100845

CustomerID: LBAP78

CustomerPO:

ProjectID:

Attn: **Nicholas Casale**
WSP USA Solutions Inc
96 Morton Street
8th floor
New York, NY 10014

Phone: (212) 612-7900
 Fax:
 Received: 01/28/21 9:00 AM

Project: 31402956.000.02.00

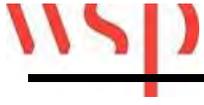
Analytical Results

Client Sample Description A 1,2,3
 Girls Room 215, Boys Room 219, Girls Room 315
Collected: 1/27/2021
Lab ID: 012100845-0001

Method	Parameter	Result	RL Units	Prep Date & Analyst	Analysis Date & Analyst
GC-SVOA					
3540C/8082A	Aroclor-1016	ND D	1.0 mg/Kg	1/28/2021 PG	01/29/21 0:00 EH
3540C/8082A	Aroclor-1221	ND D	1.0 mg/Kg	1/28/2021 PG	01/29/21 0:00 EH
3540C/8082A	Aroclor-1232	ND D	1.0 mg/Kg	1/28/2021 PG	01/29/21 0:00 EH
3540C/8082A	Aroclor-1242	ND D	1.0 mg/Kg	1/28/2021 PG	01/29/21 0:00 EH
3540C/8082A	Aroclor-1248	ND D	1.0 mg/Kg	1/28/2021 PG	01/29/21 0:00 EH
3540C/8082A	Aroclor-1254	1.0 D	1.0 mg/Kg	1/28/2021 PG	01/29/21 0:00 EH
3540C/8082A	Aroclor-1260	ND D	1.0 mg/Kg	1/28/2021 PG	01/29/21 0:00 EH
3540C/8082A	Aroclor-1262	ND D	1.0 mg/Kg	1/28/2021 PG	01/29/21 0:00 EH
3540C/8082A	Aroclor-1268	ND D	1.0 mg/Kg	1/28/2021 PG	01/29/21 0:00 EH

Definitions:

- MDL - method detection limit
- J - Result was below the reporting limit, but at or above the MDL
- ND - indicates that the analyte was not detected at the reporting limit
- RL - Reporting Limit (Analytical)
- D - Dilution Sample required a dilution which was used to calculate final results



**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

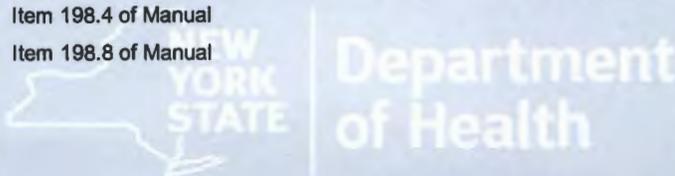
MR. JAMES HALL
EMSL ANALYTICAL, INC
307 WEST 38TH STREET
NEW YORK, NY 10018

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

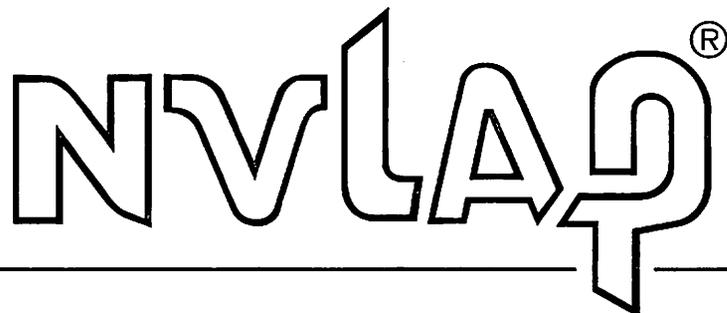
Asbestos in Friable Material	Item 198.1 of Manual EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Material	Item 198.8 of Manual



Serial No.: 61413

Property of the New York State Department of Health. Certificate are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

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



A handwritten signature in black ink, appearing to read "David S. Hamman".

For the 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

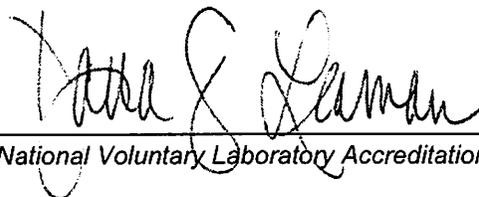
Airborne Asbestos Analysis

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

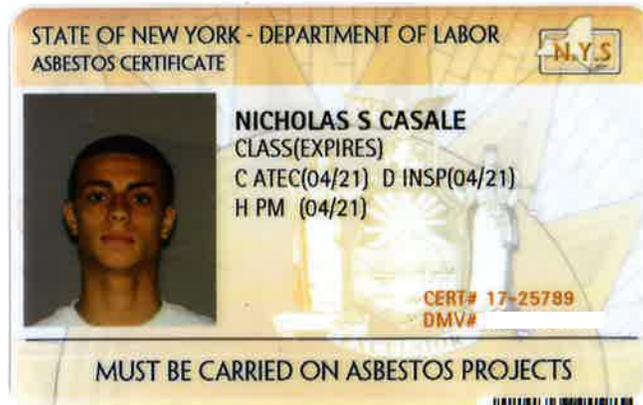


NICHOLAS S CASALE

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

A handwritten signature in black ink, appearing to read "John Gorman".

John Gorman, Chief

Pesticides & Toxic Substances Branch



STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE



STEPHEN C GRUBER

CLASS(EXPIRES)

C ATEC(06/21) D INSP(06/21)

H PM (06/21)

CERT# 17-42557

DMV# [REDACTED]

MUST BE CARRIED ON ASBESTOS PROJECTS





**APPENDIX I:
PHOTOGRAPHIC DOCUMENTATION**



Photo 1: Non-ACM Sealant to Drain (Grey)



Photo 2: Non-ACM Textured Paint to Radiator (Brown)



Photo 3: Non-ACM Firestop at Radiator Penetration (Tan)

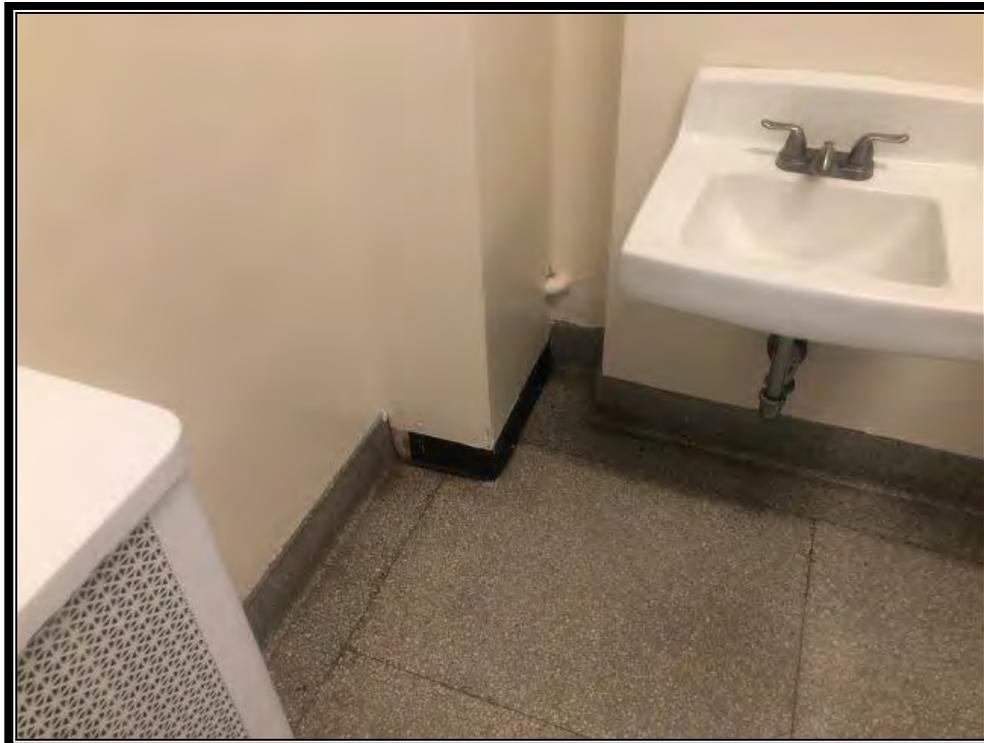


Photo 4: Non-ACM Gypsum Board (White), Joint Compound (White), Baseboard (Black) and Associated Glue (Yellow)



Photo 5: Non-ACM Fixture Caulk (White)

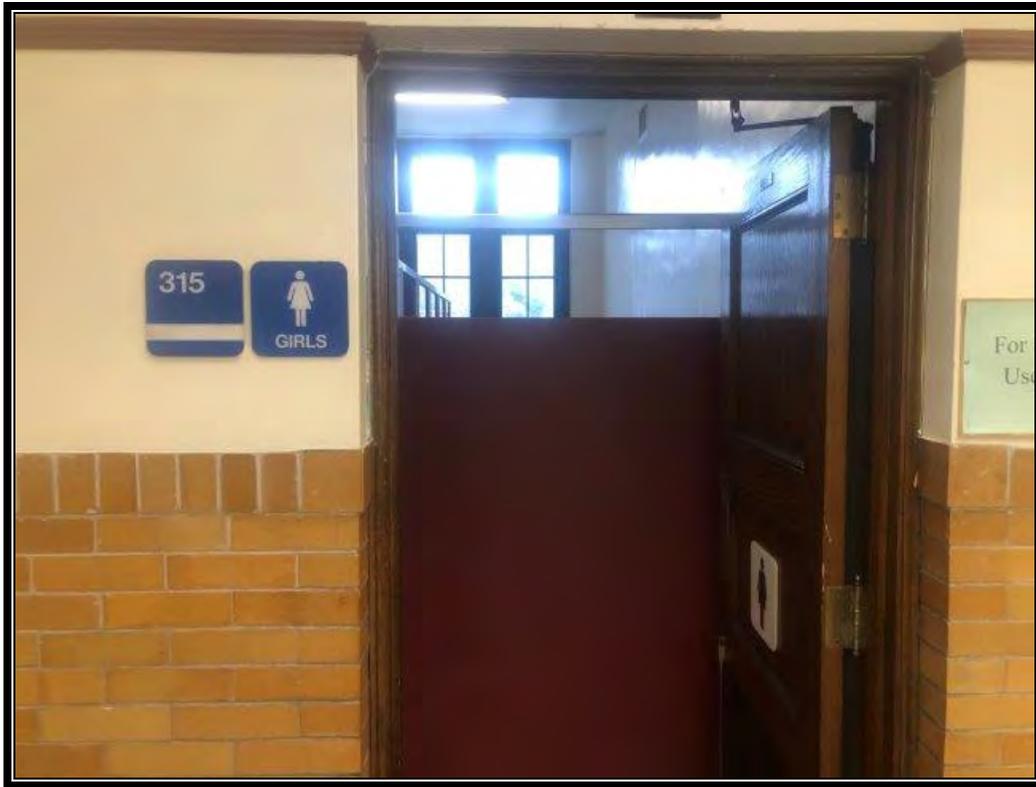


Photo 6: Non-ACM Mortar to Interior Brick Wall (Gray)



Photo 7: Non-ACM Wall Plaster and Ceiling Plaster



Photo 8: Non-ACM Grout to Ceramic Tile at Urinal (White) and Backing to Ceramic Tile at Urinal (White)

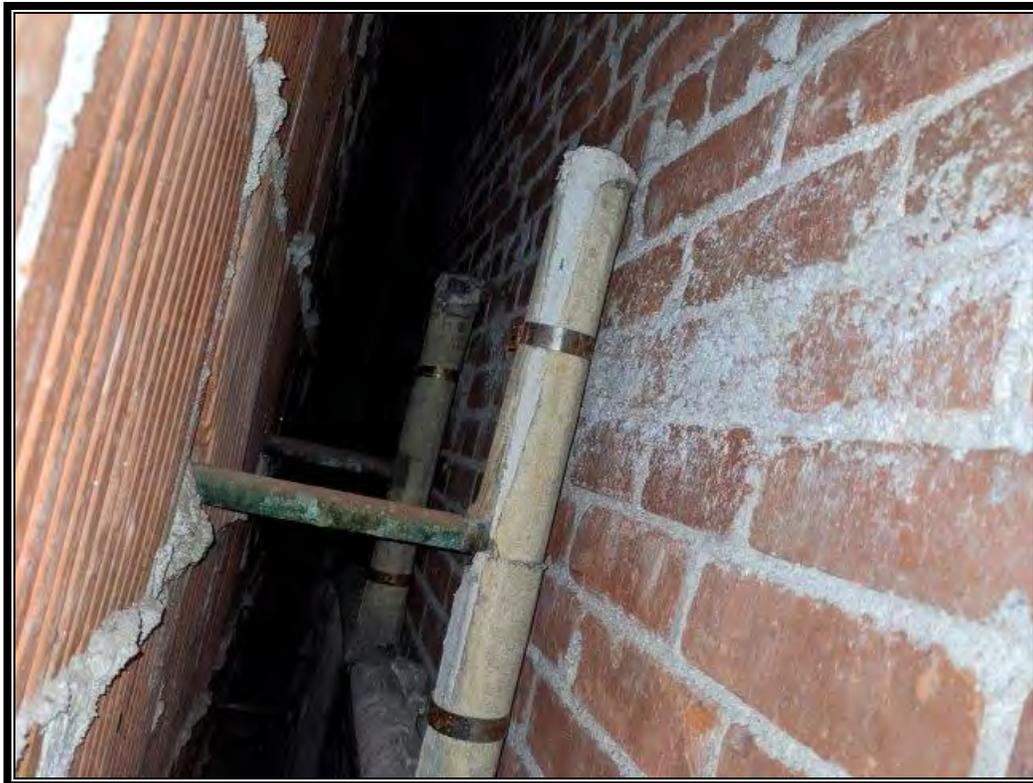


Photo 9: ACM Pipe Insulation (Grey)



**APPENDIX J:
FILE SEARCH**



565 Taxter Road, Suite 510
Elmsford, New York 10523

HOMOGENEOUS AREA SHEET

Client: White Plains Public Schools

Project Site: George Washington 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	Pipe Insulation	S	YES	YES
03	2'x4' Fissured Ceiling Tile, White	M	NO	NO
04	2'x4' Gouged Ceiling Tile, White	M	NO	NO
05	2'x4' (2'x2' Design) Fissured Ceiling Tile, White	M	NO	NO
06	1'x1' Gouged Ceiling Tile, White	M	NO	NO
07	2'x4' Large Gouged Ceiling Tile, White	M	NO	NO
08	1'x1' Large Gouged Ceiling Tile, Beige	M	NO	NO
09	2'x4' Small Pinhole Ceiling Tile, White	M	NO	NO
10	1'x1' Large Pinhole Ceiling Tile, Beige	M	NO	NO
11	2'x4' Stripe Design Ceiling Tile, Beige	M	NO	NO
12	2'x4' (2'x2' Design) Gouged Ceiling Tile, White	M	NO	NO
13	2'x4' Smooth Ceiling Tile, White	M	NO	NO
14	1' x 1' Ceiling Tile	M	NO	NO
15	Glue Dabs to 1' x 1' Ceiling Tile	M	NO	NO
16	Wall Plaster White Coat	S	NO	YES
17	Wall Plaster Brown Coat	S	NO	YES
18	Ceiling Plaster White Coat	S	NO	YES

TSI = Thermal System Insulation

S = Surfacing

M = Miscellaneous