SPECIFICATIONS FOR

EDGEMONT UNION FREE SCHOOL DISTRICT
HVAC UPGRADES AND CAFETERIA RENOVATIONS
GREENVILLE ELEMENTARY SCHOOL AND SEELY PLACE ELEMENTARY SCHOOL

SED PROJECT NO.:	GREENVILLE ELEMENTARY SCHOOL	66-04-06-03-0-008-021
	SEELY ELEMENTARY SCHOOL	66-04-06-03-0-001-019
F&D PROJECT NO.:	21434.01	
OWNER:	EDGEMONT UNION FREE SCHOOL DISTRICT	
ADDRESS:	300 WHITE OAK LANE	
CITY:	SCARSDALE, NEW YORK 10583	
PROJECT NAME:	HVAC UPGRADES AND CAFETERIA RENOVATIONS GREENVILLE ELEMENTARY AND SEELY ELEMENTARY SCHOOLS	

ARCHITECTS:

FULLER AND D'ANGELO, P.C.
Architects and Planners
45 Knollwood Road - Suite 401
Elmsford, NY 10523

FOOD SERVICE
RAYMOND AND RAYMOND
4 St. John Street
Goshen, NY 01924

MECHANICAL:

LANDMARK FACILITIES GROUP, INC
252 East Avenue
Norwalk, CT 06855

ENVIRONMENTAL
EISENBACH & RUHNKE
291 Genesee Street
Utica, NY 13501

The undersigned certifies that to the best of his knowledge, information and belief, the plans and specifications are in accordance with applicable requirements of the New York State Uniform Fire Prevention and Building Code, The State Energy

Date: January 6, 2023

DIVISION 00 PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 01 GENERAL REQUIREMENTS

DIVISION 02 – EXISTING CONDITIONS

SECTION 00 0115
LIST OF DRAWING SHEETS

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 DRAWING INDEX

A. Drawings are listed on Drawing G-1 for all contracts.

B. Drawings are the property of the Fuller and D'Angelo, Architects and Planners and shall not be used for any other purpose other than contemplated by the Drawings and Project Manual

PART 2 - PRODUCTS (NOR USED)

PART 3 - EXECUTION (NOT USED)

SECTION 00 2113
INSTRUCTIONS TO BIDDERS

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 DOCUMENT INCLUDES

A. Bid Documents and Contract Documents
   1. Definition
   2. Contract Documents Identification
   3. Availability
   4. Examination
   5. Inquiries/Addenda
   6. Product/Assembly/System Substitutions

B. Site Assessment
   1. Prebid Conference

C. Qualifications
   1. Qualifications

D. Bid Submission
   1. Bid Depository
   2. Bid Ineligibility

E. Bid Enclosures/Requirements
   1. Security Deposit
   2. Consent of Surety
   3. Performance Assurance
   4. Bid Form Requirements
   5. Bid Form Signature
   6. Additional Bid Information

F. Offer Acceptance/Rejection
   1. Duration of Offer
   2. Acceptance of Offer

1.3 RELATED DOCUMENTS

A. Section 01 1000 - Summary of Contracts

B. Section 00 4100 - Bid Form Contract #1 General Construction.

C. Section 00 4110 - Bid Form Contract #2 Plumbing

D. Section 00 4120 - Bid Form Contract #3 HVAC

E. Section 00 4130 - Bid Form Contract #4 Electrical

F. Section 00 4401 - Qualification of Bidders.

G. Section 00 4402 - Hold Harmless Agreement

H. Section 00 4301 - Bid Form Supplements

I. Section 00 4460 - Certification of Compliance With the Iran Disinvestment Act **OR**:

J. Section 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act.

K. Section 00 4476 - Insurance Certification

L. Section 00 5200 - Form of Agreement.

M. Section 00 6000 - Bonds and Certificates.

N. Section 00 7200 - General Conditions.

O. Section 01 2100 - Allowances.

P. Section 01 5000 - Temporary Facilities and Controls.

Q. Section 01 7000 - Execution.

R. Section 01 7800 - Closeout Submittals

1.4 BID SUBMISSION

A. Bids signed and under seal, executed, and dated will be received at the office of the Edgemont School District, 300 White Oak Lane , Scarsdale, NY 10583 before 11:00 AM local time on the 7th day of February, 2023.

B. Offers submitted after the above time shall be returned to the bidder unopened.

C. Offers will be opened publicly and read aloud electronically, via live stream immediately after the time for receipt of bids Edgemont Union Free School District, Business Office Conference Room, 300 White Oak Lane, Scarsdale, New York, 10583.

D. Each Bidder must bid on both schools. The Owner will award one contract to each separate Prime Contractor , The award will be based upon the cost proposal, bidder's qualifications, and ability to perform the work. Bid Bond shall be submitted for each individual school in which a proposal is submitted or a single Bid Bond if a proposal is submitted for all schools.

1.5 INTENT

A. The intent of this Bid request is to obtain an offer to perform work to complete HVAC Upgrades And Cafeteria Renovations located at the Greenville & Seely Place Elementary Schools for a Stipulated Sum, in accordance with the Contract Documents.

1.6 LUMP SUM BIDS

A. Bids will be received for four (4) separate Prime Contracts as follows:
   1. Contract #1 General Construction () (including Asbestos Abatement)
   2. Contract #2 Plumbing
   3. Contract #3 Mechanical
   4. Contract #4 Electrical

1.7 CONTRACT TIME

A. Perform the Work within the time stated in Section 01 1000 Summary of Contracts.

B. All work for this project shall not commence prior to the issuance of Letter of Award by the Owner. The items of work shall be scheduled and completed as stated in Section 01 1000 Summary of Contracts. Failure to complete either date listed in Section 01 1000 Summary of Contracts, shall subject the Contractors to be assessed liquidated damages list in Article 8 of the General Conditions and any additional costs incurred by the Owner, including but not limited to, Owner's Representative, Fuller and D'Angelo, P.C., Consultants, Owner's staff, overtime, and legal costs as required to complete the scheduled item.

C. The attention of the bidders is specifically directed to the provisions of the General Conditions of the Contract Article 8 of the General Conditions that time is of the essence to the Contract and that on no account will the Contactors be permitted to assert a claim for damages for delays.

D. The bidder, in submitting an offer, accepts the Contract Time period stated for performing the Work. The completion date stated in the Agreement and Section 01 1000 Summary of Contracts.

1.8 BID DOCUMENTS AND CONTRACT DOCUMENTS

A. Definitions: All definitions set forth in the General Conditions of the Contract and Section 01 4216 are applicable to these Instructions to Bidders.

B. Bid Documents: Contract Documents supplemented with Instructions to Bidders, Bid Form, Bid Securities, Hold Harmless Agreement, Certification of Compliance with Iran Divestment Act, Declaration of Bidders Inability to Provide Certification of Compliance, Contractor's Qualification Statement, Insurance certification, and Issued Addenda.

C. Contract Documents: Defined in General Conditions. Refer to Section 00 7200 - General Conditions

D. Bid, Offer, or Bidding: Act of submitting an offer under seal.

E. Bid Amount: Monetary sum identified by the Bidder in the Bid Form.

1.9 CONTRACT DOCUMENTS IDENTIFICATION

A. The Contract Documents are identified as Project Number 21434.01 as prepared by Fuller and D'Angelo, P.C. 45 Knollwood Road, Elmsford, NY 10523, compromising drawings and with contents as identified in the Project Manual.

1.10 AVAILABILITY

A. Bid Documents, including drawings and specifications, will be available beginning 1/6/2023 at REV Plans, 330 Route 17A, Suite 2, Goshen, NY 10924, Telephone #: 877.272.0216; www.revplans.com

1.11 EXAMINATION

A. Immediately notify Architect upon finding discrepancies or omissions in the Bid Documents.

B. Should any conflict occur in or between the Drawings and Specifications, the Contractor shall be deemed to have estimated on the more costly method of doing the work, unless he shall have asked for and obtained a decision in writing from the Architect before the submission of his bid, as to what shall govern.

1.12 INQUIRIES/ADDENDA

A. Direct questions to Architect.

B. Questions: Any and all questions about the interpretation or clarification of the Bid Documents, or about any other matter affecting the Work or pertaining to the bid must be directed in writing on the form in Section 00 2115 - RFI Form to the: Architect

Fuller and D'Angelo, P.C.
45 Knollwood Road - Suite 401 .
Elmsford, NY 10523 .
Attention: William Means, RA .
Voice: 914-592-4444
E-mail: WilliamM@fullerdangelo.com

C. Answers: The Architect will issue addenda, if necessary, to answer such questions. Bidders shall rely on answers contained in such addenda and **shall not** rely upon any oral answers given by any employee or agent of the Owner's Representative, Architect, Architect's Consultants, and Construction Manager.

1. RFI's not resulting in an addendum may be issued to all plan holder's at the discretion of Architect.

D. Addenda are written or graphic instruments issued prior to the Bid Date which modify or interpret the bidding documents, including Drawings and Specifications, by additions, deletions, clarifications or corrections. Addenda will become part of the Contract Documents when the Construction Contract is executed

E. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.

F. Verbal answers are not binding on any party.

G. Clarifications requested by bidders must be in writing not less than 5 days before date set for receipt of bids. The reply will be in the form of an Addendum, if required, a copy of which will be forwarded to known recipients .

1.13 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. Where the Bid Documents stipulate a particular product bidders shall comply with the specifications, performance and quality of the specification item. **The Architect will not review any substitutions during the bidding period.** The bidder assumes all responsibility to meet the requirements and the Architect shall be final authority as to a product is equal to the specification.

B. Refer to Section 01 2500 - Substitution Procedures for substitution requirements.

1.14 PREBID CONFERENCE

A. A Bidders Pre-Bid Conference has been scheduled for 3:30 PM Greenville Elementary School. Bidders shall meet at the Greenville Elementary School, 100 Glendale Road, Scarsdale, NY 10583.

B. Attendance is non mandatory. Bidder are strongly advised to attend.

C. All bidders, subcontractors and suppliers are invited.

D. Representatives of Owner's Representaive, Architect, and Architect's Consultants will be in attendance.

E. Summarized minutes of this meeting may be circulated to all known bidders. These minutes will not form part of the Contract Documents.

F. Information relevant to the Bid Documents will be recorded in an Addendum, issued to plan holders.

1.15 QUALIFICATIONS

A. Evidence of qualifications:

1. Bidder shall submit with their bid proposal a properly **typewritten and executed Section 00 4401 Qualification of Bidders.**

B. The Owner reserves the right to require additional information it deems appropriate concerning the history of the contractor’s performance of each such contract.

C. In accordance with the requirements of General Municipal Law §103-g, the bidder is required to include with its bid either (1) the “Certification of Compliance with the Iran Divestment Act” or, in the case where the bidder is unable to make such certification, (2) the form titled “Declaration of Bidder’s Inability to Provide Certification of Compliance with the Iran Divestment Act”. Refer to Section 00 4460 - Certification of Compliance With the Iran Disinvestment Act and 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act.

1.16 SUBCONTRACTORS/SUPPLIERS/OTHERS

A. Owner's Representaive and Architect reserves the right to reject a proposed subcontractor for reasonable cause.

B. Refer to General Conditions for additional requirements.

1.17 SUBMISSION PROCEDURE

A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.

B. Submit one copy of the executed offer on the Bid Forms included in the project manual, signed and sealed with the required security in a closed opaque envelope, clearly identified with title of the project, trade, name, and address of the bidder and Edgemont School District's name clearly on the outside.

C. Improperly completed information, irregularities in security deposit, may be cause not to open the Bid Form envelope and declare the bid invalid or informal.

D. To submit a bid for a bid package, the bidder shall photo copy or remove the proposal form from the Project Manual. Then the bidder shall complete, sign and submit the form as required therein . The bidder should not submit the entire Project Manual with the bid proposal.

E. All bid prices shall be filled in, both in words and figures. Signatures shall be in ink and in longhand. Proposals which are incomplete, conditional or obscure may be rejected as informal.

1. In case of a discrepancy between the words and figures, **the written word, not the figures,** will govern.

2. Make no erasures, cross-outs, whiteouts, write-overs, obliteration's, or changes of any kind in the Bid Form phraseology, in the entry of unit prices, or anywhere on the Bid form. Fill in all blanks spaces legibly. An illegible entry may disqualify the bid in its entirety. If a mistake is made, use a new Bid Form. No post bid meetings will be afforded to any bidder to explain or clarify illegible or changed entries.

F. Bidder's shall not rely on oral statements made by any employee or agent of the Owner, Owner's Representative, Architect, and Architect's Consultants. Before submitting a proposal, bidders shall fully inform themselves as to all existing conditions and limitations and shall include in the Proposal a sum to cover the cost of all items included in the Contract

G. No oral or telephonic proposals or modifications of proposals will be considered.

1.18 BID INELIGIBILITY

A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, blanks, or irregularities of any kind, will at the discretion of the Edgemont School District, be declared unacceptable.

B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Edgemont School District, be declared unacceptable.

C. Failure to provide security deposit, bonding or insurance requirements will, at the discretion of Edgemont School District, invalidate the bid.

D. Failure to provide all costs, including Base Bid, Allowances, and Total Base Bids will, at the discretion of Edgemont School District, invalidate the bid.

1.19 SECURITY DEPOSIT

A. Bids shall be accompanied by a security deposit as follows:
1. Bid Bond of a sum no less than 10 percent of the Bid Amount on AIA A310 Bid Bond Form, will be required for all Proposals.
2. Refer to Section 00 6000 - Bonds and Certificates for additional requirements.

B. Endorse the Bid Bond in the name of the Edgemont School District as obligee, signed and sealed by the principal (Contractor) and surety.

C. The security deposit will be returned after delivery to the Edgemont School District of the required Performance and Payment Bond(s) by the accepted bidder.

D. Include the cost of bid security in the Bid Amount.

E. After a bid has been accepted, all securities will be returned to the respective bidders .

F. If no contract is awarded, all security deposits will be returned.

1.20 CONSENT OF SURETY

A. Submit with the Bid: The attorney in fact who executes the required bonds on behalf of the surety to affix thereto an original certified and current copy of his power of attorney indicating the monetary limit of such power.

1.21 PERFORMANCE ASSURANCE

A. Accepted Bidder: Shall provide a Performance and Payment bond, as described in Section 00 6000 - Bonds and Certificates prior to the execution of the Contract, the bidder to furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in such form and amount as the Owner may prescribe and with such sureties secured through the bidder's usual sources as may be agreeable to the parties.

B. Include the cost of Performance and Payment Bonds in the Bid Amount.

C. The bidder shall require the attorney in fact who executes the required bonds on behalf of the surety to affix thereto an original certified and current copy of his power of attorney indicating the monetary limit of such power

1.22 INSURANCE

A. Provide an executed Insurance Certification Section 00 4476 - INSURANCE CERTIFICATION attached as a supplement to the proposal.

B. There are special insurance requirements on this project. Refer to Article 11 (AIA 201) of the General Conditions for a summary description of the required coverages. The Owner reserves the right to refuse the award of a Contract to any apparent low bidder who fails to provide the specified insurance certificates at the required time.

C. The Owner, Architect, and Consultants shall be listed as "Additionally Insured" on all applicable policies.

D. All insurance purchased by Contractor shall constitute primary insurance and primary coverage for all risks insured and that any other liability insurance that Owner, Architect, and Consultants may procure or maintain is secondary and that there shall be no contribution by such insurance until insurance provided by the Contractor is exhausted.

1.23 SALES AND USE TAXES

A. The Owner is a tax exempt entity, so there shall be no charge for sales or use taxes. The Owner will document this status as requested.

1.24 FEES FOR CHANGES IN THE WORK

A. Refer to the General Conditions Article 7 (AIA 201).

1.25 BID FORM SIGNATURE

A. The Bid Form shall be signed by the bidder, as follows:

1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.
2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.
3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.
4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

1.26 EQUIVALENCY CLAUSE

A. Where, in these specifications, certain kinds, types, brands, or manufacturers of material are named, they shall be regarded as the standard of quality. Where two or less are named the Contractor may select one of those items, subject to meeting the requirements of the specified product. If the contractor desires to use any kind, type, brand, or manufacture of material other than those named in the specification, he shall indicate in writing, and five (5) after Letter of Award, what kind, type, brand, or manufacture is requesting in lieu of the specified items. Submit information describing in specific detail, wherein it differs from the quality and performance required by the base specifications, and such other information as may be requested by the Owner.

B. Contractor shall refer to Form in Section 01 2500 - Substitution Procedures.

1.27 NONDISCRIMINATION

A. All Contractors and Subcontractors of all tiers and all vendors shall comply with all pertinent provisions of the State, Local and Federal law against discrimination in employment practices. Refer to Section 01 3306 - Non-Discrimination Clauses.

1.28 PREVAILING WAGES

A. New York State law requires the payment of prevailing wages on the project, as listed in Section 01 3554 - Prevailing Wage Rates.

1.29 ADDITIONAL BID INFORMATION

A. Submit the following Supplements concurrent with bid submission:
   1. Refer to the Bid Form

B. Each bidder by making his bid represents that he has read and understands the bidding documents.

C. The bidder by making his bid represents that he has visited the site and familiarized himself with the local conditions under which the work is to be performed.

1.30 DURATION OF OFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of 45 days after the bid closing date, except as otherwise provided in General Municipal Law §103 (11).

1.31 ACCEPTANCE OF OFFER

A. The bidder acknowledges the right of the Edgemont School District to reject any or all bids and to waive any informality or irregularity in any bid received. In addition, the bidder recognizes the right of the Owner, at its discretion to reject a bid if the bidder fails to furnish any required bid security, or to submit the information required by the bidding documents, including Section 00 4401 “Qualifications of Bidders”, or if the bid is incomplete or irregular.

1.32 POST-BID PROCEDURE

A. The bid proposal, allowances, the proposed subcontractors, and information received from owners of other projects will be considered to determine whether the contractor is the “lowest responsible bidder” in making the award. The Owner and Architect may make such investigation as the Owner deems necessary to determine the responsibility of any bidder or to determine the ability of any bidder to perform the Work. Such investigation shall begin with a review of Section 00 4401 - Qualification of Bidders and shall include such additional information as shall be required herein.

B. When requested by the Owner's Representative and Architect, bidders shall furnish all information and data required by the Owner's Representative and Architect within the time and in the form and manner requested. Upon notification from the Owner's Representative and Architect, the apparent low bidder shall furnish, within Two (2) working days after the bid opening, Two (2)copies of the following information in writing:
   1. Evidence of the bidder's financial responsibility, including a certified financial statement prepared by a certified public accountant. The financial statement shall include, but not limited to the following:
      a. Current assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses):
      b. Net Fixed Assets:
      c. Other Assets:
      d. Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes):
      e. Other Liabilities (e.g., Capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).
      f. The names, addresses and phone numbers of the subcontractors and suppliers that the bidder proposes to use on the project.
      g. A bar-chart showing the bidder's proposed plan and schedule to complete the bidder's work in accordance with Section 01 1000 Summary of Contractss
      h. The insurance certificates required by the Bid Documents.
      i. Resumes for Contractor’s proposed supervisory staff, including qualifications for specialized expertise or any certification(s) required to perform the Work.

j. Names of proposed major sub-contractors (more than 15% of the bid amount) and a listing of the related trade of work and value.

k. Any special coordination requirements with other trades.

l. Any special storage and staging requirements for construction materials.

m. Any other special requirements.

n. A proposed schedule of values for the bidder's work.

o. A proposed list of submittals and a proposed schedule for making them, all keyed to the bar-chart.

2. After receipt of the above information, the Owner's Representative and Architect will designate a time and place for the meeting between the Owner's Representative and Architect and the apparent low bidder. The apparent low bidder's principal, project manager and site superintendent will attend that meeting, at which time the parties will discuss the bidder's responsiveness, responsibility and qualifications.

3. The Owner's Representative and Architect reserves the right to disapprove the use of any proposed Subcontractor, and in such event, the bidder shall submit the name of another Subcontractor in like manner within the time Owner's Representative specified by the Owner and Owner's Representative, as set forth in the Agreement.

4. To the fullest extent allowed by law, the Owner reserves the right to reject any bid if the evidence required by the Owner's Representative and Architect is not submitted or fails to satisfy the Owner that the bidder is responsible, able and qualified to carry out the obligations of the Owner Contract or to complete the Work as contemplated. The Owner will consider the information received in determining whether or not to accept a proposal.

5. Acceptance of a proposal will be a notice in writing signed by a duly authorized representative of the Owner.

6. Any bidder whose proposal is accepted will be required to sign the Owner/Contractor Agreement no later than ten (10) days after notification of Award of Bid or five (5) days following receipt of Contract, whichever is later.

END OF SECTION

SECTION 00 2115
RFI FORM

CONTRACTOR'S REQUEST FOR INTERPRETATION NO. ____ **F&D RFI NO:_____**
(F&D USE)

NAME OF PROJECT: HVAC Upgrades And Cafeteria Renovations

NAME OF OWNER: **Edgemont School District**
FACILITY: **Greenville & Seely Place Elementary Schools**
DATE: **_____**
A/E PROJECT NO: **21434.01**
ARCHITECT: **Fuller and D'Angelo, P.C.**
45 Knollwood Road, Elmsford, NY 10523
Tel: 914-592-4444; Fax: 914-592-1717
William Means, RA WilliamM@fullerdangelo.com

Refer to Section 00 2113 Par 1.13 for additional requirements.

FROM (CO. NAME):_____
CONTACT NAME: _____ Tel: _____
SUBJECT: _____
DISCIPLINE/TRADE: _____
DWG./SPEC. REFERENCE: _____
QUESTION: _____
_____
_____

___FIELD CONDITION_____
___ DRAWING/SPEC _____
___ DISCREPANCY_____
___ OWNER CHANGE_____
___ CLARIFICATION _____
___ CONTRACTOR'S SUGGESTION (IF APPLICABLE): _____

ANSWER

_____
_____
_____
_____
_____

ARCHITECT'S SIGNATURE: _____DATE:_____

Note: review and any responses to this request for information by the architect/engineer is strictly for design intent only and does not constitute acknowledgement or acceptance of any cost or schedule implications unless specifically presented by the contractor. By submission of this request for information, the contractor assumes all responsibility in the absence of an approved change order or work directive.

END OF SECTION

SECTION 00 4100
BID FORM CONTRACT #1 GENERAL CONSTRUCTION

THE PROJECT AND THE PARTIES

TO:

Edgemont School District
300 White Oak Lane :
Scarsdale, NY 10583

FOR:

HVAC Upgrades And Cafeteria Renovations
Greenville & Seely Place Elementary Schools
100 Glendale Road & 51 Seely Place
Scarsdale, NY

DATE: _____ (Bidder to enter date)

All information must be typewritten. Handwritten Bid Form will be rejected.

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual _____

Telephone No. _____ E-mail: _____

1.1 OFFER

Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Fuller and D'Angelo, P.C. for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Contract No.1 General Construction Work for the Sum of:

A. **BASE BID GREENVILLE ELEMENTARY SCHOOL**

1. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No.1 General Construction at the Greenville Elementary School is as follows:

   _____

2. **Cash Allowance:** Fifteen Thousand_____ ($15,000.00) DOLLARS
3. Door Access Control Allowance: Three Thousand _____($3,0000.00) DOLLARS

4. **TOTAL BASE BID GREENVILLE ELEMENTARY SCHOOL**

   The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No.1 General Construction at the Greenville Elementary School is as follows:

   _____
   _____($_____) DOLLARS

B. **BASE BID SEELY PLACE ELEMENTARY SCHOOL**

1. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No.1 General Construction at the Seely Place Elementary School is as follows:

   _____
   _____($_____) DOLLARS

2. **Cash Allowance:** Fifteen Thousand_____ ($15,000.00) DOLLARS
3. Door Access Control Allowance: Three Thousand _____($3,0000.00) DOLLARS

4. **TOTAL BASE BID SEELY PLACE ELEMENTARY SCHOOL**
The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No.1 General Construction at the Greenville Elementary School is as follows:

_____
_____($_____)DOLLARS

C. **GRAND TOTAL BID GREENVILLE & SEELY PLACE ELEMENTARY SCHOOLS**

The Grand Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No.1 General Construction and Related Work work at the Greenville Elementary School and Seely Place Elementary School is as follows:

_____
_____ $_____), DOLLARS

(The Total Base Bid is sum of 1.1.A.4.a and 1.1.B.4.a).

Note: Bidder must submit proposal for BOTH facilities. Contract will not be awarded for one facility.

D. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in accordance with the drawings and specifications and any addenda thereto, and to accept in full compensation therefore the amount of the Total Base Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

E. We have included the required security Bid Bond.

F. We have included the required Performance and Payment bonds **costs** in the Bid Amount.

G. All applicable federal taxes and NY taxes are included in the Total Bid Sum.

H. All Allowances described in Section - 01 2100 - Allowances are included in the Total Bid Sum.

1.2 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date.

B. If this bid is accepted by Edgemont School District within the time period stated above, we will:
1. Execute the Agreement within ten (10) days of receipt of Notice of Award or five (5)days following receipt of Contract, whichever is later.
2. Furnish the required Performance and Payment bonds within ten (10) days of receipt of Notice of Award or with the executed Contract.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bonds, the security deposit shall be forfeited as damages to Edgemont School District by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.3 REJECTION OF BIDS

A. The undersigned agrees that the Owner shall have the right to accept or reject any or all bids.

1.4 CONTRACT TIME

A. If this Bid is accepted, we will:
1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1000 Summary of

Contract. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the AIA 232-2019 General Conditions of the Contract.

1.5 CHANGES TO THE WORK

A. Refer to AIA 232-2019 General Conditions of the Contract Article 7.

1.6 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.7 BID FORM SUPPLEMENTS

A. Refer to Section 00 4301 Bid Form Supplements Cover Sheet.

1.8 NON-COLLUSIVE BIDDING CERTIFICATION

A. By submission of this bid or proposal:
   1. The undersigned bidder and the person or persons signing on behalf of the bidder, and should this bid be a joint bid, each party thereto, certifies as to its own organization, under penalty of perjury, that to the best of his/her knowledge and belief:
      a. 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.
      b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor.
      c. 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.

1.9 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:
   1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
   2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
   3. That said bidder is not in arrears to the Edgemont School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Edgemont School District
   4. That no member of the Edgemont School District or any officer or employee of the Edgemont School District or person whose salary is payable in whole or in part from the Edgemont School District treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
   5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.

6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.10 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

_____

(Authorized signing officer, Title)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

Subscribed and sworn before me this day of____ 202*_____

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4110
BID FORM CONTRACT #2 PLUMBING

THE PROJECT AND THE PARTIES

TO:

Edgemont School District
300 White Oak Lane :
Scarsdale, NY 10583

FOR:

HVAC Upgrades And Cafeteria Renovations
Greenville & Seely Place Elementary Schools
100 Glendale Road & 51 Seely Place
Scarsdale, NY

DATE: _____ (Bidder to enter date)

All information must be typewritten. Handwritten Bid Form will be rejected.

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual _____

Telephone No. _____ E-mail: _____

1.1 OFFER

Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Fuller and D'Angelo, P.C. for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Contract No. 2 Plumbing Work for the Sum of:

A. BASE BID GREENVILLE ELEMENTARY SCHOOL

1. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 2 Plumbing at the Greenville Elementary School is as follows:
2. **Cash Allowance:** Five Thousand _____($5,000.00) DOLLARS
3. **TOTAL BASE BID GREENVILLE ELEMENTARY SCHOOL**

_____
_____($_____)DOLLARS

B. BASE BID SEELY PLACE ELEMENTARY SCHOOL

1. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 2 Plumbing at the Seely Place Elementary School is as follows:

_____
_____($_____)DOLLARS
2. **Cash Allowance:** Five Thousand _____ ($5,000.00) DOLLARS
3. **TOTAL BASE BID SEELY PLACE ELEMENTARY SCHOOL**

_____
_____($_____)DOLLARS

C. **GRAND TOTAL BASE BID GREENVILLE & SEELY PLACE ELEMENTARY SCHOOLS**

1. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 2 Plumbing and Related Work work at the Greenville Elementary School and Seely Place Elementary School is as follows:

_____
_____ ($_____) DOLLARS

(The Total Base Bid is sum of 1.1.A.3.a and 1.1.B.3.a.

Note: Bidder must submit proposal for BOTH facilities. Contract will not be awarded for one facility.

D. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in accordance with the drawings and specifications and any addenda thereto, and to accept in full compensation therefore the amount of the Total Base Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

E. We have included the required security Bid Bond.

F. All applicable federal taxes and NY taxes are included in the Total Bid Sum.

G. All Allowances described in Section - 01 2100 - Allowances are included in the Total Bid Sum.

1.2 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date.

B. If this bid is accepted by Edgemont School District within the time period stated above, we will:

1. Execute the Agreement within ten (10) days of receipt of Notice of Award or five (5)days following receipt of Contract, whichever is later.
2. Furnish the required Performance and Payment bonds within ten (10) days of receipt of Notice of Award or with the executed Contract.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bonds, the security deposit shall be forfeited as damages to Edgemont School District by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.3 REJECTION OF BIDS

A. The undersigned agrees that the Owner shall have the right to accept or reject any or all bids.

1.4 CONTRACT TIME

A. If this Bid is accepted, we will:

1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the AIA 232-2019 General Conditions of the Contract Article 7.

1.5 CHANGES TO THE WORK

A. Refer to AIA 232-2019 General Conditions of the Contract Article 7

1.6 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.7 BID FORM SUPPLEMENTS

A. Refer to Section 00 4301 Bid Form Supplements Cover Sheet.

1.8 NON-COLLUSIVE BIDDING CERTIFICATION

A. By submission of this bid or proposal:
   1. The undersigned bidder and the person or persons signing on behalf of the bidder, and should this bid be a joint bid, each party thereto, certifies as to its own organization, under penalty of perjury, that to the best of his/her knowledge and belief:
      a. 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.
      b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor.
      c. 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.

1.9 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:
   1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
   2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
   3. That said bidder is not in arrears to the Edgemont School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Edgemont School District
   4. That no member of the Edgemont School District or any officer or employee of the Edgemont School District or person whose salary is payable in whole or in part from the Edgemont School District treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
   5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.
   6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.10 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

_____

(Authorized signing officer, Title)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

Subscribed and sworn before me this day of____ 20**_____

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4120
BID FORM CONTRACT #3 HVAC

THE PROJECT AND THE PARTIES

TO:

Edgemont School District
300 White Oak Lane :
Scarsdale, NY 10583

FOR:

HVAC Upgrades And Cafeteria Renovations
Greenville & Seely Place Elementary Schools
100 Glendale Road & 51 Seely Place
Scarsdale, NY

DATE: _____ (Bidder to enter date)

All information must be typewritten. Handwritten Bid Form will be rejected.

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual _____

Telephone No. _____ E-mail: _____

1.1 OFFER

Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Fuller and D'Angelo, P.C. for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Contract No. 3 HVAC Work for the Sum of:

A. **BASE BID GREENVILLE ELEMENTARY SCHOOL**

1. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 3 HVAC at the Greenville Elementary School is as follows:

   _____

2. **Cash Allowance:** Fifteen Thousand_____ ($15,000.00) DOLLARS
3. **TOTAL BASE BID GREENVILLE ELEMENTARY SCHOOL**
4. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 3 HVAC at the Greenville Elementary School is as follows:

   _____

   _____($_____)DOLLARS

B. **BASE BID SEELY PLACELEMENTARY SCHOOL**

1. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 3 HVAC at the Seely Place Elementary School is as follows:
2. **Cash Allowance:** Ten Thousand_____ ($10,000.00) DOLLARS
3. **Commissioning Allowance:** Twenty Thousand_____($20,000.00) DOLLARS
4. **TOTAL BASE BID SEELY PLACE ELEMENTARY SCHOOL**

a. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 3 HVAC at the Greenville Elementary School is as follows:

_____
_____($_____) DOLLARS

C. **GRAND TOTAL BASE BID GREENVILLE & SEELY PLACE ELEMENTARY SCHOOLS**

1. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 3 HVAC and Related Work work at the Greenville Elementary School and Seely Place Elementary School is as follows:

_____
_____ ($_____) DOLLARS

(The Total Base Bid is sum of 1.1.A.4.a and 1.1.B.4.a)

Note: Bidder must submit proposal for BOTH facilities. Contract will not be awarded for one facility.

D. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in accordance with the drawings and specifications and any addenda thereto, and to accept in full compensation therefore the amount of the Total Base Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

E. We have included the required security Bid Bond.

F. All applicable federal taxes and NY taxes are included in the Total Bid Sum.

G. All Allowances described in Section - 01 2100 - Allowances are included in the Total Bid Sum.

1.2 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date.

B. If this bid is accepted by Edgemont School District within the time period stated above, we will:

1. Execute the Agreement within ten (10) days of receipt of Notice of Award or five (5)days following receipt of Contract, whichever is later.
2. Furnish the required Performance and Payment bonds within ten (10) days of receipt of Notice of Award or with the executed Contract.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bonds, the security deposit shall be forfeited as damages to Edgemont School District by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.3 REJECTION OF BIDS

A. The undersigned agrees that the Owner shall have the right to accept or reject any or all bids.

1.4 CONTRACT TIME

A. If this Bid is accepted, we will:

1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the AIA 232-2019 General Conditions. of the Contract Article 7.

1.5 CHANGES TO THE WORK

A. Refer to AIA 232-2019 General Conditions of the Contract Article (7)

1.6 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.7 BID FORM SUPPLEMENTS

A. Refer to Section 00 4301 Bid Form Supplements Cover Sheet.

1.8 NON-COLLUSIVE BIDDING CERTIFICATION

A. By submission of this bid or proposal:
   1. The undersigned bidder and the person or persons signing on behalf of the bidder, and should this bid be a joint bid, each party thereto, certifies as to its own organization, under penalty of perjury, that to the best of his/her knowledge and belief:
      a. 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.
      b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor.
      c. 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.

1.9 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:
   1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
   2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
   3. That said bidder is not in arrears to the Edgemont School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Edgemont School District
   4. That no member of the Edgemont School District or any officer or employee of the Edgemont School District or person whose salary is payable in whole or in part from the Edgemont School District treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
   5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.
   6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.10 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

_____

(Authorized signing officer, Title)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

Subscribed and sworn before me this day of____ 20**_____

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4130
BID FORM CONTRACT #4 ELECTRICAL

THE PROJECT AND THE PARTIES

TO:

Edgemont School District
300 White Oak Lane :
Scarsdale, NY 10583

FOR:

HVAC Upgrades And Cafeteria Renovations
Greenville & Seely Place Elementary Schools
100 Glendale Road & 51 Seely Place
Scarsdale, NY

DATE: _____ (Bidder to enter date)

All information must be typewritten. Handwritten Bid Form will be rejected.

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual _____

Telephone No. _____ E-mail: _____

1.1 OFFER

Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Fuller and D'Angelo, P.C. for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Contract No. 4 Electrical Work for the Sum of:

A. BASE BID GREENVILLE ELEMENTARY SCHOOL

1. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 4 Electrical at the Greenville Elementary School is as follows:
2. **Cash Allowance:** Seven Thousand Five Hundred_____ ($7,500.00) DOLLARS
3. **TOTAL BASE BID GREENVILLE ELEMENTARY SCHOOL**
   a. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 4 Electrical at the Greenville Elementary School is as follows:

   _____
   _____($_____)DOLLARS
4.

B. BASE BID SEELY PLACELEMENTARY SCHOOL

1. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 4 Electrical at the Seely Place Elementary School is as follows:

   _____
   _____($_____)DOLLARS
2. **Cash Allowance**: Seven Thousand Five Hundred_____ ($7,500.00) DOLLARS
3. **TOTAL BASE BID SEELY PLACE ELEMENTARY SCHOOL**

a. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 4 Electrical at the Greenville Elementary School is as follows:

_____
_____($_____)DOLLARS

C. **GRAND TOTAL BASE BID GREENVILLE & SEELY PLACE ELEMENTARY SCHOOLS**

1. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 4 Electrical and Related Work work at the Greenville Elementary School and Seely Place Elementary School is as follows:

_____
_____ ($_____), DOLLARS

(The Total Base Bid is sum of 1.1.A.3.a and 1.1.B.3.a)

Note: Bidder must submit proposal for BOTH facilities. Contract will not be awarded for one facility.

D. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in accordance with the drawings and specifications and any addenda thereto, and to accept in full compensation therefore the amount of the Total Base Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

E. We have included the required security Bid Bond.

F. All applicable federal taxes and NY taxes are included in the Total Bid Sum.

G. All Allowances described in Section - 01 2100 - Allowances are included in the Total Bid Sum.

1.2 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date.

B. If this bid is accepted by Edgemont School District within the time period stated above, we will:

1. Execute the Agreement within ten (10) days of receipt of Notice of Award or five (5)days following receipt of Contract, whichever is later.
2. Furnish the required Performance and Payment bonds within ten (10) days of receipt of Notice of Award or with the executed Contract.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bonds, the security deposit shall be forfeited as damages to Edgemont School District by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.3 REJECTION OF BIDS

A. The undersigned agrees that the Owner shall have the right to accept or reject any or all bids.

1.4 CONTRACT TIME

A. If this Bid is accepted, we will:

1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the AIA 232-2019 General Conditions of the Contract.

1.5 CHANGES TO THE WORK

A. Refer to AIA 232-2019 General Conditions of the Contract Article 7

1.6 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.7 BID FORM SUPPLEMENTS

A. Refer to Section 00 4301 Bid Form Supplements Cover Sheet.

1.8 NON-COLLUSIVE BIDDING CERTIFICATION

A. By submission of this bid or proposal:
   1. The undersigned bidder and the person or persons signing on behalf of the bidder, and should this bid be a joint bid, each party thereto, certifies as to its own organization, under penalty of perjury, that to the best of his/her knowledge and belief:
      a. 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.
      b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor.
      c. 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.

1.9 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:
   1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
   2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
   3. That said bidder is not in arrears to the Edgemont School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Edgemont School District
   4. That no member of the Edgemont School District or any officer or employee of the Edgemont School District or person whose salary is payable in whole or in part from the Edgemont School District treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
   5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.
   6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.10 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

_____

(Authorized signing officer, Title)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

Subscribed and sworn before me this day of____ 20**_____

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4301
BID FORM SUPPLEMENTS COVER SHEET

PARTICULARS

TO: **Edgemont School District**

Architect's Project Number : **21434.01**

Project Description: **Greenville & Seely Place Elementary Schools**
HVAC Upgrades And Cafeteria Renovations

Date: _____

Please type form.

Submitted By: (Bidder to insert full name and address)

_____

_____

_____

Tel: _____E-Mail: _____

A. In accordance with Section 00 2113 - Instructions to Bidders and Bid Form - we include the Supplements To Bid Form listed below. The information provided shall be considered an integral part of the Bid Form.

1.1 SUPPLEMENTS TO BID FORM

A. Section 00 4401 - Qualification of Bidders.

B. Section 00 4402 - Low Bid Affidavit

C. Section 00 4460 - Certification of Compliance With the Iran Disinvestment Act OR

D. Section 00 4470 - Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act.

E. Section 00 4476 - INSURANCE CERTIFICATION.

F. Section 00 6000 - Bonds and Certificates (Bid Bond).

SIGNATURE(S)

The Corporate Seal of

_____

(Bidder please type the full name of Authorized signing Officer, Title of your Proprietorship, Partnership, or Corporation)

subscribed and sworn before me this day of____ 202_____

_____

Notary Public: _____

My Commission Expire: _____

(Authorized signing officer Title)

(Seal)

END OF SECTION

SECTION 00 4401
QUALIFICATION OF BIDDERS

1.1 REQUIREMENTS

A. The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

B. With the submittal of the Bid Proposal Form, **the bidder shall attach this Qualification of Bidders** and shall answer all the questions and provide all information requested herein. Failure to answer these questions or provide information requested in full may be cause for rejection of the bidder's proposal. If more space is needed, attach additional sheets with reference to subject paragraph.

C. The Owner reserves the right to consider, but not limited to, the financial responsibility, experience and reputation in the construction industry, as well as the specific qualifications listed below and elsewhere in this document in considering bids and awarding the contract. Edgemont School District reserves the right to waive any informalities if, at its discretion the interest of the Edgemont School District will be better served.

D. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit written evidence of financial position and current commitments, license to perform work in the State NY .

E. Each Company (Bidder) shall have been in existence under the same name for no less than ten (10) years.

F. The bidder is not currently involved in bankruptcy proceedings.

G. The bidder is capable of and intends and intends to perform the work with its own employees in accordance with Article 5.2.5 of the General Conditions.

1. The bidder is capable of and intends to perform the work with its own employees in accordance with the following:
    a. Not withstanding any other provisions of the Contract Documents, General Contractor shall perform at least twenty (25%) of the field work by its own employees.
    b. Not withstanding any other provisions of the Contract Documents of the field work by its own employees Contractors for HVAC, Plumbing, and Electrical shall perform at least seventy-five (75)% of the field work by its own employees.
    c. For the purpose of the preceding paragraph, any part of the work performed by supervisory personnel (persons above level of foreman) or by the office personnel and such items as bonds, certificates, shop drawings and similar items shall not be considered part of the percentage of work required to be performed by the Contractor's employees.

H. Each subcontractor must have a minimum of five (5) years experience in the work and/or applicable trade.

I. The bidder will perform the work with sufficient personnel as required to comply with the schedule.

J. Field Superintendent must have at least five (5) years experience as a working field superintendent and must speak English or have a translator available at all times at no cost to the Owner.

K. Each Company (Bidder) shall have successfully completed three (3) projects within the last five (5) years substantially similar in scope, size, complexity and dollar value to the work of this project.

L. Each Company (Bidder) shall furnish, on the attached form, three (3) projects it has performed during the most recent five (5) years including, but not limited to, the name and address of the project, the name of the awarding entity/owner, the name of the awarding entity's/owner's representative, construction manager and architect, current telephone numbers where each can be reached, the description of the project, general scope of the contractor's work, contract price, dates of performance, whether the contract was terminated for cause or convenience, whether the contract was completed on time and whether liquidated damages were assessed against the contractor, and if so, to any items above provide a written explanation.

1. The Owner's Representative and Architect reserves the right to require additional information it deems appropriate concerning the history of the contractor's performance of each such contract.

M. The final determination of whether the contractor possesses the requisite experience rests in the sole discretion of the Owner.

1.2 QUESTIONAIRE:

A. **All information must be typewritten. Handwritten information will be rejected.**

Submitted to: Edgemont School District

Address: 300 White Oak Lane

City/Town: Scarsdale, NY 10583

Submitted By: _____

Corporation _____Partnership _____ Individual_____

Address:_____

Principal Office:_____

Other: _____

Project: HVAC Upgrades And Cafeteria Renovations

Facility: Greenville & Seely Place Elementary Schools

Type of Work: (file separate for each Classification of Work)

1. General Construction____, HVAC____, Plumbing____, and Electrical____ .

1.3 ORGANIZATION

A. **All information must be typewritten. Handwritten information will be rejected.**

B. How many years has your organization been in business as a Contractor? _____

1. How many years has your organization been in business under its present business name? _____
2. Under what other or former names has your organization operated?

_____

_____

C. What is the firm's bonding range?

Single:_____ Aggregate: _____

D. If your organization is a corporation, answer the following:

1. Date of Incorporation: _____
   a. State of Incorporation: _____
   b. President's Name:_____
   c. Vice-president's name(s): _____
   d. Secretary's name: _____
   e. Treasurer's name: _____

E. If your organization is a partnership, answer the following:

1. Date of organization:_____
   a. Type of partnership (if applicable):_____ _____
   b. Name(s) of general partner(s): _____

_____

F. If your organization is individually owned, answer the following:

1. Date of organization:_____
2. Name of owner: _____

G. If the form of your organization is other than those listed above, describe it and name the principals:

_____

_____

1.4 OWNERSHIP, MANAGEMENT, AFFILIATION

A. Identify each person who is or has been ,within the past five years, an owner of 5.0% or more of the firm's shares, one of the five largest shareholders, a director, an officer, a partner or the proprietor, or a managerial employee.

First Name: _____MI___Last Name_____DOB_____

% Owned: __ Director: Yes__ No__ Officer: Yes__ No__ Title _____artner: Yes__ No____

First Name: _____MI____Last Name_____DOB_____

% Owned: __ Director: Yes__ No__ Officer: Yes__ No__ Title _____Partner: Yes__ No_____

First Name: _____MI____Last Name_____DOB_____

% Owned: __ Director: Yes__ No__ Officer: Yes__ No__ Title _____Partner: Yes__ No____

B. Has the firm or any firm listed in response to questions above defaulted or been terminated and its surety called upon to complete, any contract awarded within the past five years Yes ___ No ___ If yes, give date(s), agency (ies)/owner(s), project(s), contract numbers, and describe including the result:

_____

_____

C. List below any projects performed by the bidder in the past five (5) years on which any of the following events occurred:

1. Were any extension of time were requested by the contractor, Yes__ No __and were such requests granted? Yes__ No __
2. Was litigation and/or arbitration commenced by either the Owner or the bidder as a result of the work of the project performed by the bidder? Yes __ No __
3. Were any liens filed on the project by subcontractors or material suppliers of the bidder? Yes__ No __
4. Did the bidder make any claims for extra work on the project, and did said claim result in a change order? Yes__ No ___
5. If Yes:

Project Name/Address_____

Type of Event_____

Name & Phone # of Owner: _____

Contact Person at Owner: _____

D. For all contracts within the past five years: (a) List all liens or claims over $25,000 filed against the firm and remaining undischarged or unsatisfied for more than 90 days; and (b) list and describe all liquidated damages assessed: _____

_____

1.5 FINANCIAL INFORMATION

A. Submit firm's most recent annual financial statement and Dun and Bradstreet Report..

1.6 OTHER INFORMATION

A. Within the past five years has the firm, any affiliate, any predecessor company or entity or any person identified in questions number 1.1 through 1.2 above been the subject of any of the following: (Respond to each question and describe in detail the circumstances of each affirmative answer: (Attach additional pages if necessary).

1. A judgment of conviction for any business-related conduct constituting a crime under state or federal law No__ Yes__
2. A criminal investigation or indictment for any business-related conduct constituting a crime under state or federal law? No__ Yes__

3. A grant of immunity for any business-related conduct constituting a crime under state and federal law? No__ Yes__
4. A federal or state suspension or debarment? No__ Yes__
5. A rejection of any bid for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid? No__ Yes__
6. A denial or revocation of prequalification? No__ Yes__
7. A voluntary exclusion from bidding/contracting agreement? No__ Yes__
8. Any administrative proceeding or civil action seeking specific performance or restitution in connection with any public works contract except any disputed work proceeding? No__ Yes__
9. An OSHA Citation and Notification of Penalty containing a violation classified as serious? No__ Yes__
10. An OSHA Citation or Notification of Penalty containing a violation classified as willful? No__ Yes__
11. A prevailing wage or supplement payment violation? No__ Yes__
12. A State Labor Law violation deemed willful? No__ Yes__
13. Any other federal or state Citations, Notices, violation orders, pending administrative hearings or proceedings or determinations of a violation of any labor law or regulation? No__ Yes__
14. Any criminal investigation, felony indictment or conviction concerning formation of or any business association with, an allegedly false or fraudulent women's, minority or disadvantaged business enterprise? No__ Yes_
15. Any denial, desertification, revocation or forfeiture of Women's Business Enterprise, Minority Business Enterprise or Disadvantaged Business Enterprise status? No__ Yes_
16. Rejection of a low bid on a State contract for failure to meet statutory affirmative action M/WBE requirements? No__ Yes_
17. A consent order with the NYS Department of Environmental Conservation or a federal, state or local government enforcement determination involving a violation of federal or state environmental laws? No__ Yes_
18. Any bankruptcy proceeding? No__ Yes__
19. Any suspension or revocation of any business or professional license? No__ Yes_
20. Any citations, notices, violation orders, pending administrative hearings or proceedings or determinations for violation of hearings or proceedings or determinations for violation of:
    a. Federal, state or local health laws, rules or regulations? No__ Yes_
    b. Federal, state or local environmental laws, rules and regulations? No__ Yes_
    c. Unemployment insurance or workers compensation coverage or claim requirements. No__ Yes_
    d. ERISA (Employee Retirement Income Security Act) No__ Yes_
    e. Federal, state or local human rights laws. No__ Yes_
    f. Federal, state or local labor laws. No__ Yes__
    g. Federal or state security laws. No__ Yes_
    h. Withdrawal or an agreement to withdraw a bid submitted to a public owner or a request by a public owner to withdraw a bid? No__ Yes_

B. During the five year period preceding the submissions of this bid, has the bidder been named as a party in any lawsuit in an action involving a claim for personal injury or wrongful death arising from performance 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. No__ Yes_

C. During the five year period preceding the submission of this bid, has the bidder been the subject of 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. No__ Yes_

D. 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 Worker's 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 such instance of violation and the status of the claimed violation at the time of disposition of this bid. No__Yes __

E. 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 submission of the charge. No__Yes__

F. 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. No__ Yes_

G. Has the bidder ever defaulted or had its surety called upon to complete any contract awarded within the past five years. If the answer to this question is yes, list the projects, the dates and the nature of the termination (convenience, suspension, for cause). No__ Yes_

H. Has any officer or partner of the bidder's organization ever defaulted or had its surety called upon to complete any contract awarded within the past five years or been an officer or partner of some other organization that has been terminated from a project by an owner? If yes, state: No__ Yes__

I. Name of Individual(s) _____ Name of Organization(s) Reason(s)

_____

_____

1.7 LICENSING

A. List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration of license numbers, if applicable.

_____

_____

B. List jurisdictions in which your organization's partnership or trade name is filed:

_____

_____

C. Has any director, officer, owner or managerial employee had any professional license suspended or revoked? If the answer is yes, list the name of the individual, the professional license he/she formally had, whether the license was revoked or suspended and the date of the revocation or suspension. No__ Yes__

1.8 EXPERIENCE

A. List the categories of work that your organization will perform with its own forces:

_____

_____

B. Claims and Suits. (If the answer of any of the questions below is yes, please attach details.)

1. Have you or has any director, officer, owner or managerial employee ever failed to complete any work awarded to them? If yes, list the project(s) the date(s) and the reason(s) for the failure to complete. No____ Yes___
2. Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers? No____ Yes_____
3. Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years? No____ Yes____

4. Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.) No____ Yes____

C. On a separate sheet, list all construction projects presently your organization has in progress or completed, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

D. State total worth of work in progress and under contract:

_____

E. On a separate sheet, list all projects, not listed above, that your organization has completed or in progress in the past five years, giving the name of the project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

F. State average annual amount of construction work performed during the past five years: _____

_____

G. On a separate sheet, list the construction experience and present commitment of the key individuals of your organization.

1.9 APPRENTICE PROGRAM

A. Has the Firm have in place apprenticeship agreements appropriate for the type and scope of work to be performed, that have been registered with, and approved by, the Commissioner of the New York State Department of Labor pursuant to the requirements found in Article 23 of the Labor Law. No__ Yes_

1.10 REFERENCES

A. Trade reference: _____

B. Bank references: _____

C. Surety: _____

1. Name of present bonding company: _____
2. Name and address of agent: _____
3. Name or previous bonding company: _____

1.11 CERTIFICATION

A. The undersigned recognizes that this questionnaire is submitted for the purpose of the Edgemont School District awarding a contract or approving a subcontract; acknowledges that the Edgemont School District may in its discretion, by means which it may choose, determine the truth and accuracy of all statements made herein; acknowledge that intentional submission of false or misleading information may constitute a felony under Penal Law §210.40 or a misdemeanor under Penal Law §210.35 or §210.45, and may also be punishable by a fine of up to $10,000.00 or imprisonment of up to five years under 18 U.S.C. §1001; and states that the information submitted in this questionnaire any attached pages is true, accurate and complete.

Dated at this day of _____

Name of Organization: _____

By: _____Title_____

being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading. Subscribed and sworn before me this day of:_____

Notary Public: _____My Commission Expire: _____

See Project Information Form attached.

PROJECT NAME: _____

Company work was performed under: _____

Who was Co. Principal in charge: _____

Location: _____

Cost of the Contract: _____ **Final Cost of the Work:** _____

Description of the Work:

_____

_____

_____

Owner's Name:

_____

Owners Contact: Name _____ **Phone**_____ **E-Mail** _____

CM Name(If Applicable: _____

CM Contact: Name _____ **Phone**_____**E-Mail**_____

Architect Firm: _____

Architect Contact: _____**PhoneE**_____ **E-Mail**_____

PROJECT NAME: _____

Company work was performed under: _____

Who was Co. Principal in charge: _____

Location: _____

Cost of the Contract: _____ **Final Cost of the Work:** _____

Description of the Work:

_____

_____

_____

Owner's Name:

_____

Owners Contact: Name _____ **Phone**_____ **E-Mail** _____

CM Name(If Applicable: _____

CM Contact: Name _____ **Phone**_____**E-Mail**_____

Architect Firm: _____

Architect Contact: _____**PhoneE**_____ **E-Mail**_____

PROJECT NAME: _____

Company work was performed under: _____

Who was Co. Principal in charge: _____

Location: _____

Cost of the Contract: _____ **Final Cost of the Work:** _____

Description of the Work:

_____

_____

Owner's Name:

_____

Owners Contact: Name _____ **Phone**_____ **E-Mail** _____

CM Name(If Applicable: _____

CM Contact: Name _____ **Phone**_____**E-Mail**_____

Architect Firm: _____

Architect Contact: _____**Phone**_____ **E-Mail**_____

END OF SECTION

SECTION 00 4402
HOLD HARMLESS AGREEMENT

_____herein the "CONTRACTOR" assumes responsibility for any and all injury to or death of any and all persons, including the CONTRACTOR'S agents, servants and employees, and in addition thereto, for any and all damages to property caused by or resulting from or arising out of any act or omission in connection with this contract or the prosecution of work hereunder, whether caused by the CONTRACTOR or the CONTRACTOR'S agents, servants or employees, or the CONTRACTOR'S subcontractors or suppliers, and the CONTRACTOR shall indemnify and hold harmless the owner, the Edgemont School District, and the (engineer/architect) Fuller and D'Angelo, P.C. their employees and consultants from and against any and all loss and/or expense which they or either of them may suffer or pay as a result of claims or suits due to, because of or arising out of any and all such injuries, deaths and/or damage. The CONTRACTOR if requested, shall assume and defend at the CONTRACTOR'S own expense, any suit, action or other legal proceedings arising therefrom, and the CONTRACTOR hereby agrees to satisfy, pay and cause to be discharged of record any judgment which may be rendered against the owner or architect arising therefrom.

Dated at _____ this day of 202___ .

Signed, Sealed and Delivered

SIGNED _____

Name_____
Title_____

in the presence of by:

Name_____Title_____

SECTION 00 4460
CERTIFICATION OF COMPLIANCE WITH THE IRAN DISINVESTMENT 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 Owner receive information that a Bidder/Contractor is in violation of the above-referenced certification, the Owner 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 Owner 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 Owner 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 _____202___

Notary Public: _____

END OF SECTION

SECTION 00 4470
DECLARATION OF BIDDER'S INABILITY TO PROVIDE CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT.

WITH THE IRAN DIVESTMENT ACT

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

Name of the Bidder: _____

Address of Bidder: _____

Has bidder been involved in investment activities in Iran? _____

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

_____
_____
_____

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

Have the investment activities ended? _____

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

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

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

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

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

_____
_____
_____
_____
_____
_____
_____

I, _____ being duly sworn, deposes and says that he/she is the _____ of the _____ Corporation and the foregoing is true and accurate.

_____

SIGNED

SWORN to before me this

_____ day of _____ 202___

Notary Public: _____

SECTION 00 4476
INSURANCE CERTIFICATION

BID OR PROJECT NO. # 21434.01

NAME OF PROJECT: HVAC Upgrades And Cafeteria Renovations

Insurance Representative's Acknowledgement:

We have reviewed the insurance requirements set forth in the bid and are capable of providing 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: _____

Tele. #: _____ **E-Mail:**

_____

Are you an agent for the companies providing the coverage?

Yes_____**No** _____

DATE:_____

_____

Signature Insurance Representative

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 a certificate of insurance must be submitted with my contract and if it is not, the Edgemont School District will reject my bid and award to the next lowest qualified bidder.

FIRM NAME: _____

ADDRESS: _____

Tele.#_____ **E-Mail:** _____

DATE: _____

_____

Bidder's Signature

SECTION 00 5200
FORM OF AGREEMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 FORM OF AGREEMENT

A. The Agreement to be executed is attached following this page.

B. AIA Document A101/CMa, Owner-Contractor Agreement Form - Stipulated Sum - Construction Management Edition 2019, forms the basis of Contract between the Owner and Contractor.This form has been revised and all revisions have been included in the document, a draft copy is attached..

1.3 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions.

B. Section 01 4216 - Definitions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

DRAFT

AIA® Document A132™ – 2019

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

AGREEMENT made as of the « » day of « » in the year « »

BETWEEN the Owner:

Edgemont School District « »« »
300 White Oak Lane « »
Scarsdale, NY 10583
« »

and the Contractor:

« »« »
« »
« »
« »

for the following Project:

« » HVAC Upgrades and Cafeteria Renovations
Greenville Elementary School
Seely Place Elementary School
« »

The Construction Manager:

Triton Construction, 100 Quentin Roosevelt Blvd Suite 200 Garden City, NY 11530, 516-780-8100, Kevin Sawyer, k-sawyer@tritonconstruction.com « »« »
The Architect:

Fuller & D'Angelo, PC
Architects and Planners
45 Knollwood Road – Suite 401
Elmsford, NY 10523

The Owner and Contractor agree as follows.

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.

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

.1 A date set forth in or Letter of Award issued by the Owner.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion of the Project or Portions Thereof

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

.1 As indicated in **Section 01100-Summary of Contracts Section 01 1010 Milestone Schedule** or for various phases, if any, of work and overall completion**.**

»

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

Portion of Work	Substantial Completion Date
	As indicated in **§ 3.3.1** above

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

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:

(Check one of the following boxes and complete the necessary information.)

[« »] By the following date: « As indicated in **§ 3.3.1** above »

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

Portion of Work	Date to be substantially complete
	As indicated in **§ 3.3.1** above.

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 Stipulated Sum

§ 4.1.1 The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

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

Item	Price

§ 4.2.2.2 Subject to the conditions noted below, the following alternates have been accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.

Item	Price	Conditions for Acceptance

§ 4.2.3 Allowances, if any, included in the Contract Sum:

Item	Price

§ 4.2.4 Unit prices, if any:

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Liquidated damages, if any:

1. As indicated in Article 8 of the General Conditions »
2. «None»

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments (Refer to Section 01 2000 Price and Payment Procedures for Additional Requirements).

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

§ 5.1.1.1 Provide a separate application for each school building. Include the SED and Fuller and D'Angelo's project number

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

.1 As indicated in Section 00 5200 Form of Agreement.

§ 5.2 Final Payment
§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum
§ 5.2.1.1 Refer to Section 01 7800 Closeout Submittals
.1 As indicated in Section 01 7800 Closeout Submittals »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker
The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.

§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
.1 Litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum
§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
.1 «To be negotiated between Owner and Contractor. Failure to agree the issue shall be resolved in a court of competent jurisdiction.
»

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

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

§ 8.2 The Owner's representative:

« »
« »
« »
« »
« »
« »

§ 8.3 The Contractor's representative:

« »
« »
« »
« »
« »

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

§ 8.5 Insurance and Bonds

§ 8.5.1 Refer to Section 00 6000.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

.1 « »

§ 8.7 Other provisions:

.1 « »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

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

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

.3 Drawings

Number	Title	Date
. Refer to Exhibit A		

.4 Specifications

Section	Title	Date	Pages
Refer to Exhibit B			

.5 Addenda, if any:

Number	Date	Pages

.6 Other documents, if any, listed below:

«None»

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

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

SECTION 00 6000
BONDS AND CERTIFICATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 BID BOND:

A. A Bid Bond will be required for this project. Each individual bid shall be accompanied by a check upon a duly authorized State, National Bank or Trust Company, duly certified in the sum equal to TEN (10%) percent of the total amount of the bid, , or a Bid Bond in the amount of TEN (10%) of the bid, , payable to the Edgemont School District and shall be enclosed in an envelope containing the bid; as a guarantee that the Bidder will, after the award is made to him, enter into a bona fide contract with the Owner for the work, and furnish the bonds and liability policies as required under the specifications. The AIA 310 - 2010 edition entitled "Bid Bond" shall be the contract bond form for this project. A draft copy is attached.

1. Each bid bond must also be accompanied by the written consent of the Surety Company authorized to do business in the State of New York and be A.M Best "Secured" rated or better.
2. Attorney-in-fact who execute said bonds on behalf of a surety must affix thereto a certified and effectively dated copy of their Power of Appointment and Certification of an officer of the surety that the Power of Attorney continues in effect.

B. If, for any reason, whatsoever, the Bidder fails to enter into a proper contract and to execute the proper bonds, as required by these specifications, the amount of said guarantee retained by the Owner shall be larger amount of (a) the Bid Bond or (b) the difference 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

C. All certified checks, except the check of the Bidder to whom a contract is awarded, will be returned to the respective Bidders, as soon as the Letter of Award has been issued by the Owner.

1. The check of the Bidder, to whom a contract has been awarded, shall be retained until the contract has been executed and all bonds together with an approved liability insurance policy are filed with the Owner.

1.3 PERFORMANCE AND PAYMENT BOND:

A. A Performance and Payment Bond will be required for this project. The bond premiums will be paid for by the Contractor and included in the Bid.

B. The American Institute of Architects, AIA Document A312 - 2010 edition, entitled “Performance Bond" and AIA Document A312, 2010 edition, entitled "Payment Bond" and shall be the contract bond form for this project. AIA Document A311 is not acceptable.

C. Each bond shall be a sum equal to One Hundred (100%) of the Contract Sum and shall be in a form satisfactory to the Owner, and shall be underwritten by a surety company authorized to do business in the State of New York and be AM Best Secured Rating of "A" or better as to Policy Holder Ratings and "VII" or better as to Financial Size CategoryRated or bettter.

1. Paragraph 6 shall be deleted and substituted with the following:
   a. When the Claimant has satisfied the conditions of Paragraph 4, and has submitted all supporting documentation and any proof of claim requested by the Surety, the Surety shall, with reasonable promptness, notify the Claimant of the amounts that are undisputed and the basis for challenging any amounts that are disputed, including, but not limited to, the lack of substantiating documentation to support the claim as to entitlement or amount, and the Surety shall, with reasonable promptness, pay or make arrangements for payment of any undisputed amount; provided, however, that the failure of the Surety to timely discharge its obligations under this paragraph or to dispute or identify any specific defense to all or any part of a claim shall not be deemed to be an admission of liability by the Surety as to such claim or otherwise constitute a waiver of the Contractor's or Surety's defenses to, or right to dispute, such claim. Rather, the Claimant shall have the immediate right, without further

notice, to bring suit against the Surety to enforce any remedy available to it under this Bond."

D. Every Bond under this paragraph must display the Surety's Bond Number.

E. Each bond must be accompanied by an original Power of Attorney, giving the name of attorney's in fact and extent of bonding capacity.

F. The Surety Company shall be obligated for the bonds for a two year period after substantial completion.

G. 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 the 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 Owner.
3. Surety agrees that it is obligated under the bonds to any successor, grantee or assignee of the Owner.

H. The Contractor shall keep the surety informed of the progress of the Work, and, where necessary, obtain the surety's consent to, or waiver of: (1) request for reduction or release of retention; (2) request for final payment; and (3) any other material required by the surety. The Owner and Architect shall be notified by the Contractor, in writing, of all communications with the surety.

I. The Owner may, in the Owner's sole discretion and without prior notice to the Contractor, inform the Contractor's 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.

J. If the surety on any bond furnished by the 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.

K. Performance and payment bonds may be required from any Subcontractor whose subcontract exceeds One Hundred Thousand Dollars ($100,000.00). All such bonds shall be in the identical format of the Contractor's bonds.

L. Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the contract, the Contractor shall promptly furnish a copy of the bonds and is deemed to authorize the Owner and Architect to furnish a copy of the bonds

END OF SECTION

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR: **SURETY:**

OWNER:
Edgemont School District
300 White Oak Lane
Scarsdale, NY 10583

BOND AMOUNT: $

PROJECT:
HVAC Upgrades and Cafeteria Renovations
Greenville Elementary School
Seely Place Elementary School

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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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.

Signed and sealed this day of ,

	(Contractor as Principal) *(Seal)*
(Witness)	*(Title)*
	(Surety) *(Seal)*
(Witness)	*(Title)*

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
Name, legal status and principal place of business)

(Row deleted)
OWNER:

Edgemont School District
300 White Oak Lane
Scarsdale, NY 10583

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
(Row deleted)
Description:

HVAC Upgrades and Cafeteria Renovations
Greenville Elementary School
Seely Place Elementary School

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**	**OWNER'S REPRESENTATIVE:** *(Architect, Engineer or other party:)*

ADDITIONS AND DELETIONS:
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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 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 documents..

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to allow Contractor access to site to complete project in accordance with the contract schedule.

§ 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:

.1 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 the 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 Owner.

.2 Surety agrees that it is obligated under the bonds to any successor, grantee or assignee of the Owner

.3 Each material or equipment supplier or subcontractor shall provide a partial release of liens every 60 days or as otherwise agreed upon between Owner and Contractor.

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

Init.

/

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

(Row deleted)
OWNER:

Edgemont School District
300 White Oak Lane
Scarsdale, NY 10583

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
(Row deleted)
Description:

HVAC Upgrades and Cafeteria Renovations
Greenville Elementary School
Seely Place Elementary School

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	

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

(FOR INFORMATION ONLY — Name, address and telephone)
AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:
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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 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 When the Claimant has satisfied the conditions of Paragraph 4, and has submitted all supporting documentation and any proof of claim requested by the Surety, the Surety shall, with reasonable promptness, notify the Claimant of the amounts that are undisputed and the basis for challenging any amounts that are disputed, including, but not limited to, the lack of substantiating documentation to support the claim as to entitlement or amount, and the Surety shall, with reasonable promptness, pay or make arrangements for payment of any undisputed amount; provided, however, that the failure of the Surety to timely discharge its obligations under this paragraph or to dispute or identify any specific defense to all or any part of a claim shall not be deemed to be an admission of liability by the Surety as to such claim or otherwise constitute a waiver of the Contractor's or Surety's defenses to, or right to dispute, such claim. Rather, the

Claimant shall have the immediate right, without further notice, to bring suit against the Surety to enforce any remedy available to it under this Bond.

§ 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.

SECTION 00 7200
GENERAL CONDITIONS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 FORM OF GENERAL CONDITIONS

A. AIA Document A232 - 2019 General Conditions of the Contract for Construction - Construction Manager, as Advisor Edition, attached, is the General Conditions between the Owner and Contractor has been revised and all deletions and additions have been incorporated, and is hereby made a part of the specifications. All references to the General Conditions within these specifications shall mean "General Conditions of the Contract for Construction" the American Institute of Architects, A.I.A., Document A232 2019 Edition, as revised.

1.3 RELATED REQUIREMENTS

A. Section 00 5200 - Agreement Form

B. Section 01 4216 - Definitions01 4216.

END OF DOCUMENT

AIA® Document A232™ – 2019

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

for the following PROJECT:

HVAC Upgrades and Cafeteria Renovations
Greenville Elementary School
Seely Place Elementary School

THE CONSTRUCTION MANAGER:

Triton Construction, 100 Quentin Roosevelt Blvd Suite 200 Garden City, NY 11530, 516-780-8100, Kevin Sawyer, k-sawyer@tritonconstruction.com

THE OWNER:

Edgemont School District
300 White Oak Lane
Scarsdale, NY 10583

THE ARCHITECT:

Fuller and D'Angelo, P.C.
Architects and Planners
45 Knollwood Road
Elmsford, N.Y. 10523

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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

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TABLE OF ARTICLES

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, , sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals

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

§ 1.1.3 The Work. The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

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

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

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

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

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

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.2.4 In the event of conflict, ambiguity and/or unclear circumstances between any of the requirements of the Contract Documents, the requirement that is most inclusive of the highest quality and/or of the highest cost shall govern. The Contractor herewith agrees that no extra compensation shall be awarded to him, since he herewith received specific instructions to the procedure and values of the work.

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will establish the protocols for the development, use, transmission, and exchange of digital data. Neither the Owner, Architects or its agents are obligated to provide any available digital data or information to the contractor.

(Paragraphs deleted)
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ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative. Refer to Section 01 4216 for additional definitions.
(Paragraph deleted)
§ 2.1.2. In the event of conflict, ambiguity and/or unclear circumstances between any of the requirements of the Contract Documents, the requirement that is most inclusive of the highest quality and/or of the highest cost shall govern. The Contractor herewith agrees that no extra compensation shall be awarded to him, since he herewith received specific instructions to the procedure and values of the work.

§ 2.2 Information and Services Required of the Owner

§ 2.2.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for **the building permit**, necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. All other permits required from local agencies required for construction shall be paid for by the Contractor.

§ 2.2.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number. Refer to Section 01 4216 for additional definitions.

§ 2.2.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number. Refer to Section 01 4216 for additional definitions.

§ 2.2.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.2.5 The Owner shall provide surveys, if available, describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall exercise proper precautions relating to the safe performance of the Work.

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

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

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

§ 2.3 Owner's Right to Stop the Work

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

(Paragraphs deleted)

§ 2.4 Owner's Right to Carry Out the Work

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

(Paragraphs deleted)

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative. Refer to Section 1.1.5

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

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

§ 3.1.4 The plural term "Multiple Prime Contractors" refers to persons or entities who perform construction under contracts with the Owner that are administered by the Construction Manager. The term does not include the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager. Refer to Section 1.1.6

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the

purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.2.5 Except as to any reported errors, inconsistencies or omissions, and to concealed or unknown conditions defined in Paragraph 3.2.4, by executing the Agreement, the Contractor represents the following:

§ 3.2.5.1 The Contract Documents are sufficiently complete and detailed for the Contractor to (1) perform the work required to produce the results intended by the Contract Documents and (2) comply with all the requirements of the Contract Documents, within the time permitted for the completion of the work.

§ 3.2.5.2 The Work required by the Contract Documents, including, without limitation, all construction details, construction means, methods, procedures and techniques necessary to perform the work, use of materials, selection of equipment and requirements of product manufacturers will be consistent with: (1) good and sound practices within the construction industry; (2) generally prevailing and accepted industry standards applicable to Work; (3) requirements of any warranties applicable to the work; and (4) all laws, ordinances, regulations, rules and orders which bear upon the Contractor's performance of the work.

§ 3.2.6 Building-In: Contractor(s) and sub-contractors shall note the parts and materials which must be built in as the work progresses, including but not limited to all templates, forms, sleeves, inserts, parts, blocks, anchors, etc. for all work throughout and shall furnish to or set for the Contractor for General Construction in time to prevent delay in the work. Contractors shall also comply with Section 01 7310 or Section 01 7000 Cutting and Patching.

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Contractor is solely responsible for managing labor and labor relations, including labor disputes or concerted activity, direct or indirect, without any delays or interference with the work schedule and/or other contractors at the site. No delay in the performance of the Work shall be excused by reason of labor problems affecting the Contractor or any subcontractor. In the event of strikes or labor disputes by other separate prime contractors, or other contractors performing work for the Owner under other Contracts, each contractor shall continue with its work and provide all necessary manpower as required to maintain the schedule and completion dates of the project.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect and Construction Manager in accordance with Section 3.12.8 or ordered by the Architect and Construction Manager in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive. Any request by the Contractor to make modifications to the work or substitutions shall not in any way cause or result in the delay of the ordering of any materials or equipment or the scheduling of the Work. Any such request shall require a minimum of **thirty days'** notice to the Owner and Architect and shall include full documentation of all costs and the time necessary. The full cost of any request by the Contractor for a modification or substitution, including but not limited to the cost of fees for the review of such request by the Owner, Construction Manager and Architect or legal counsel and any delay time, shall be borne by the Contractor. Refer to Section 01 2500 Substitution Procedures.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. Should any disorderly, incompetent, or objectionable person be hired or employed by a Contractor, upon or about the premises of the Owner, for any purpose or in any capacity, he shall upon the request of the Construction Manager or Architect, be discharged from the work, and not again be employed thereon without the written permission of the Construction Manager or Architect

§ 3.5 Warranty

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

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

§ 3.5.2 The warranties set forth herein shall survive termination of this Contract.

§3.5.2.1 The Contractor agrees to assign to the Owner at the time of final completion of the Work, any and all

manufacturer's warranties relating to materials and labor used in the work and further agrees to perform the work in such a manner so as to preserve any and all such manufacturer's warranties.

§3.5.2.2 All new installations, assemblies, systems, equipment, and labor and materials installed by this Contractor shall be guaranteed against all defects and failures for a minimum period of 2 years from the date of final completion.

§3.5.2.3 For the above stated time periods from the date of final completion, the Contractor shall, at his own expense, promptly repair and put into first class condition any workmanship and materials in which defects may develop, and shall, at his own expense, promptly replace all defective equipment, apparatus, fixtures and materials, to the full satisfaction of the Owner.

§3.5.2.4 The date of final completion of all work shall be stated in writing by the Architect/Engineer and as acknowledged in writing by the Contractor.

§3.5.2.5 During the guarantee period, the Contractor shall be responsible for all costs, incurred in making the defective work good, both for labor and materials, and for all resulting injuries and damages to the building and to equipment.

§3.5.2.6 The guarantee provided by the Contractor is in addition to any warranty provided by equipment and material manufacturer. The Contractor's guarantee period shall not negate the longer guarantee period provided by equipment and material manufacturers.

§3.5.2.7 The Contractor warrants good title to all materials, supplies and equipment installed or incorporated in the work

§3.5.2.8 The Contractor for itself and its successors and assigns, warranties to the Owner and their successors and assigns:

a. The Warranty shall remain in effect for a period of time specified by appropriate Divisions of Specifications.
b. The Contractor will make good at its own cost and expense all defects and all damage caused to the Owner, in all Work and all trades required by the Contract Documents for Warranty Work. All corrections to defective Work shall be made at the convenience of the Owner

§ 3.5.2.9 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with and issuance of the Certificate of Substantial Completion.

§ 3.5.3 Refer to Section 01 7800 Closeout Submittal for additional requirements

§ 3.6 Taxes

§ 3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.6.2 Each Contractor shall pay all applicable local, state, federal and other taxes and licenses

§ 3.6.3. The Owner is exempt from sales and use taxes for materials fully incorporated into the Work of the Contract as accepted and approved by the Architect. The Owner will take title to materials used in the Project in order to permit tax exemption. The Contractor shall pay all other sales, consumer, use and similar taxes incurred in connection with the Work provided by the Contractor. The Owner's exemption from sales and use tax does not apply to machinery, equipment, tools and other items purchased, leased, rented or acquired for the Contractor's use in part or entirely in connection with the Work. Upon request of the Owner or the Architect, the Contractor shall provide 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 Project sites, the Contractor shall mark or otherwise identify the materials to be incorporated into the Work. The Owner's tax exemption shall apply only to materials so identified and accepted.

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

§ 3.7.1 Unless otherwise provided paragraph in 3.6.1in the Contract Documents, the Contractor shall secure and pay for all other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded. The Contractor shall pay any costs or fees incurred to comply with such requirements, any fines or penalties imposed for failing to comply and any costs or fees incurred by Owner due to any failure to comply. If the Contractor fails to give such notices, the Contractor shall be liable for and shall indemnify and hold harmless the Owner including its Board of Education, Architect, Construction Manager and their respective consultants, employees, officials, officers and agents against any resulting fines, penalties, judgements or damages, including reasonable attorney's fees imposed on or incurred by the parties indemnified hereunder.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work. The Contractor shall procure and obtain all bonds required of the Owner or by the municipality in which the project is located or by any other public or private body with jurisdiction over the Project. In connection with such bonds, the Contractor shall prepare all applications, supply all necessary back-up material and furnish the surety with any required personal undertakings. The Contractor shall also obtain and pay all charges for all approvals for street closings, parking meter removal and other similar matters as may be necessary or appropriate from time to time for the performance of the Work.

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

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

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

§ 3.8 Allowances

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

§ 3.8.2

(Paragraphs deleted)

Payments for Allowances and additional requirements Refer to Section 01 2100 for requirements.

(Paragraph deleted)

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The superintendent shall be at the site at all times when work is being performed and be fluent in English and be provided at all time with direct communications (cell phone) to all parties.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. including addresses and telephone numbers of the members of his organization who can be contacted in the event of an off-hours emergency at the building site. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

§ 3.10 Contractor's Construction and Submittal Schedules Refer to Section 01 3216 or 01 3000 for additional requirements

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors. Revisions to schedule shall be approved by the Owner. Comply with 3.10.3

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

§ 3.10.2.1 All of the dates provided for in any of the schedules prepared by the Contractor and submitted to the Construction Manager and Architect, including all milestone and submittal dates, shall be considered to be "time of the essence" and may not be changed or modified without the Owner or Construction Manager's specific written approval.

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

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data, and Samples

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

§ 3.12.1.2 Refer to Section 01 3000 Administrative Requirements for additional requirements.

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

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

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

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

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

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

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

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on

previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

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

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

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

§ 3.13 Use of Site

§ 3.13.1 The Contractor(s) shall have limited access to the site on the inside and outside of the building. Comply with other sections regarding limited access. The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

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

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents. Refer to Section 01 01731 or Section 01 1700 for additional requirements.

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

§ 3.15 Cleaning Up

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

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

§ 3.15.3 Prior to occupancy the Owner must perform custodial cleaning of the work area. If the Contractor has not remove construction debris, equipment, tool etc which will prevent the Owner to perform custodial cleaning the Contractor will be back charged for additional cleaning costs incurred by the Owner.

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

§ 3.18.1 Indemnity Agreement - Compliance with the foregoing requirements as to insurance shall not relieve the contractor from liability under the indemnity agreement set forth in the general conditions as amended.

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

§3.18.1.2 In the event that any party is requested but refuses to honor the indemnity obligations hereunder, then the party indemnifying shall in addition to other obligations, pay the cost to the party requesting indemnification or seeking enforcement and enforcing this indemnity requirement including, but not limited to attorney's fees.

§3.18.1.3 In addition, to the extent not covered above, the contractor or subcontractor shall defend, indemnify and hold harmless the Owner, Construction Manager, Architect, Architect's Consultants, and agents and employees of any of them, from any and all claims, losses, damages, suits, obligations, fines, penalties, costs, charges and expenses, which may be imposed 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 with respect to violations of OSHA requirements, rules and/or regulations

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

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

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

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

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

§ 4.2 Administration of the Contract

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

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents and to perform such inspections and observations as are necessary to allow the Architect to review and approve change orders, claims of any kind and interim and general requisitions for payment, all in accordance with the applicable provisions of the Contract Documents However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

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

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

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

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

through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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

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

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

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

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

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. Refer to Section 01 3000 for additional requirements.

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

§ 4.2.13.1 Neither the Construction Manager nor Architect may issue instructions to the Contractor to change the amount of the contract, except by properly executed Change Order.

§4.2.13.2 Instructions are issued by the Owner through the Construction Manager, 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, Construction Manager, Architect and Contractor, authorizing a change in the Contract amount or an adjustment to the Contract Sum.

§4.2.13.3 No amount shall be payable by the Owner to the Contractor for performance of work without an executed change order. Comply also Article 7.

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

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

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

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

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

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith. Should the Architect's written interpretations, in the opinion of the Contractor, show additional work, or work of more expensive character than that shown or inferred by the Contract Drawings, it shall be the duty of the Contractor to so notify the Construction Manager and Architect within five (5) days from receipt of same in order that proper adjustment may be made if found justifiable in the opinion of the Construction Manager and Architect. The Contractor shall assume full responsibility for all such work done without the approval of the Owner, Construction Manager and the Architect.

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, within 10 days after award of the Contract, shall notify the Construction Manager, in writing, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection. Copies of all subcontractor contracts are to be provided to the Construction Manager.

§ 5.2.2 Each Contractor shall not award any work to any subcontractor or supplier without prior written approval of the Construction Manager and Architect. Approval will not be given until Contractor submits to the Construction Manager and Architect a written statement concerning the proposed award to the sub-contractor. The statement shall contain such information as the Construction Manager and Architect will require.

§ 5.2.3 If the Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Construction Manager and Architect have no reasonable objections. No increase in the Contract Price shall be allowed where a subcontractor is rejected by the Construction Manager or Architect or who is deemed unqualified to perform the particular work subcontracted by the Contractor or having too many current projects handled by insufficient personnel.

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

§ 5.2.5 Notwithstanding any other provisions of the Contract Documents, General Contractor shall perform at least twenty-five (25) % of the field work by its own employees.

.1 Prime/Sub Contractors for HVAC, Plumbing and Electrical shall perform at least seventy-five (75) % of the field work by its own employees.

.2 Roofing Contractors shall perform at least sixty-five (65) % of the field work by its own employees, including wood blocking, insulation, roofing, flashings, roof accessories, skylights and sheet metal work.

§ 5.2.5.1 For the purpose of the preceding paragraph, any part of the work performed by supervisory personnel (persons above level of foreman) or by the office personnel and such items as bonds, certificates, shop drawings and similar items shall not be considered part of the percentage of work required to be performed by the Contractor's employees.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor

that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors. The agreement between the Contractor and Subcontractor shall not provide, nor shall the Contract Documents be deemed to provide, any rights, remedies or redress by the Subcontractor(s) against the Owner.

(Paragraphs deleted)

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation. Should any Contractor sustain any damage or delay through any act or omission of any other Contractor having a contract with the Owner for the delivery and/or the installation of materials, supplies, equipment, plant, or appliances, or should the Contractor sustain any damage or delay through any act or omission of a subcontractor, the Contractor shall have no claim against the Owner or their Architects for such damage or delay, but shall have a right to recover or to claim such damage only from the other Contractor or subcontractor.

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

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

§ 6.2 Mutual Responsibility

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that are not apparent.

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

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

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

§ 6.2.6 Claims and other disputes and matters in question between the Contractor and a separate contractor shall be subject to the provisions of Article 15.

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. Change Orders shall be submitted in total amounts for a particular change not in installments for each trade thereafter. All partial change order submissions will be rejected and returned to each Contractor for completion.

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

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

§ 7.2 Change Orders

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

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.
.4 In case where allowances as shown on the bid form and accepted by the Owner, they shall be used to determine the amount of addition to or deduction from the Contract Price. The unit prices or allowances when mutually agreed to be fair and equitable by Owner and Contractor will be made part of the Agreement.

§ 7.2.2 Final determination of all claims shall be by the Owner

§ 7.3 Construction Change Directives

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

§ 7.3.1.1 If the Construction Change Directive involves an adjustment to the contract price, the adjustment will be computed by the Architect in form conforming to 7.3.3.5.

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

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

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

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

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

.4 All additions and deductions to the Contract Price not covered by unit prices resulting from changes in the Work shall be determined by the following outline:

.5 CONTRACT WORK

a. Materials (Itemized Breakdown) _____

b. Rent of Equipment (Listed separately) _____

c. Sales Taxes (where applicable on Sub-Total #l) _____

d. Labor (Itemized Breakdown) _____

e. Insurance (Workmen's Compensation Social security or as otherwise required and/or specified) _____

Sub-Total #2 (items c, d & e) _____

f. Overhead & Profit (% x Sub-Total #2) _____
As per Article 7.3.

g. Sub-contract Work
(If applicable, in identical breakdown, as shown above Sub-Total #1 & 2) _____

h. Contractor's overhead & profit on sub-contract changes (5%) _____

Sub-Total #3 (items f, g & h) _____

i. **TOTAL QUOTATION (Sub totals 1, 2, 3)** _____

§ 7.3.3.1 Change Orders shall be submitted in total amounts for a particular change, not in installments for each trade thereafter. All partial change order submissions will be rejected and returned to the Contractor for completion.

.1 Overhead and profit combined, included in the total cost to the Owner, shall be based on the following schedule:

For the Contractor, for any Work performed by the Contractor's own forces, ten percent (10%) of the cost.
For the Contractor, for Work performed by Contractor's sub-contractor, five percent (5%) of the amount due the sub-contractor.
For each sub-contractor or sub-contractor involved, ten percent (10%) of the cost

.2 Cost to which overhead and profit is to be applied shall be limited to the following:

Labor.
Cost of Materials, including sales tax and cost of delivery.
Workers' or Workmen's Compensation Insurance.
Rental value of equipment and machinery.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.4.1 In order to facilitate checking of quotations for extras or credits, all proposals, shall be accompanied by a complete itemization of costs including labor, materials and sub-contracts. Labor and materials shall be itemized in the

manner prescribed above. Where major cost items are sub-contracts, they shall be itemized also. All change orders without such itemization will be returned to the Contractor for resubmission

§ 7.3.4.2
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§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15. Failure to timely file any claim in accordance with the requirements set forth therein shall constitute a waiver of such claim.

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

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

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

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

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

(Paragraphs deleted)

§ 7.4 Minor Changes in the Work

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

§7.4.2 Minor Changes in the work are not to be construed as Change Orders. A signed minor change is not an approved change order.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

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

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

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

§ 8.1.5 Dates indicated in Section 01 1000 Summary of Work or Section 01 11010 Milestone Schedule 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 8. Liquidated damages applied to Substantial Completion shall apply to Milestone Dates.

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; or (3) by other causes that the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended for such reasonable time as the Construction Manager may determine. No extension of time will be granted for changes in the work or labor disputes, or work stoppage due to asbestos removal. This paragraph shall control where a conflict appears among the contract documents.

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

§ 8.3.3 Notwithstanding anything to the contrary in the Contract Documents, an extension in the Contract Time, to the extent permitted under Paragraph 8.3.1, 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 (4) other similar claims (collectively referred to in this Paragraph 8.3.3 as delays) whether or not such delays are foreseeable, unless a delay is caused by acts of the Owner constituting 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 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, without limitation, 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, without limitation, 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 Contract's performance of the work.

§ 8.4 DAMAGES

§ 8.4.1 Contractor realizes that time is of the essence on this Contract and the date of Substantial Completion shall be no later than the date set forth in Article 3.2 of the Contract. The Contractor understands that substantial disruption of

the school district's educational process will occur if the project is not completed by the date of substantial completion. In the event the Contractor fails to substantially complete the work under this contract by said scheduled date(s), the Contractor will be assessed Liquidated Damages the sum per calendar day, as follows:

Contracts having a value of $50,000 to $250,000	$500 per day
Contracts having a value of $250,001 to $5,000,000	$1,000 per day
Contracts having a value in excess of $5,000,000	$1,500.00 per day

Contractor (or, if the amount due the Contractor as Payment is insufficient, any deficiency shall be paid by the Contractor to the Owner, except in cases where a delay is due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Government, in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine and will, at the sole discretion of the Owner, be subtracted from the payment due the net restrictions, freight embargoes, or delays of Subcontractors or Suppliers due to such causes. Delay in acquisition of materials other than by reason of or freight embargoes will not constitute a delay excusable under this provision unless approved by the Owner in writing.

§8.4.2 Within five calendar days from the occurrence of any such delay, the Contractor shall notify the Construction Manager, in writing, of the cause of delay. The Construction Manager will ascertain the facts and extent of the delay, and extend the time for completing the Work when, in his judgment, the findings of fact justify such an extension. Construction Manager's findings of fact will be final.

§8.4.3 In addition to Liquidated Damages, the Contractor shall be liable for all additional costs incurred by the Owner due to the failure of the Contractor to complete each Phase as required. The additional costs shall include but not be limited to the following:

§8.4.3.1 Staff, as required, to make the facility accessible to the contractor; the Construction Manager, Architect and Consultants to perform inspections after the completion date of each phase.

§8.4. 3.2 The cost of additional inspections by the Architect and their consultants will be at the rate of $300.00 per hour per consultant.

§8.4.4 The said sum per calendar day and additional costs set out above, 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 reason of delay) Owner may incur as a result of Contractor's breach of Contract, to include those which may be incurred pursuant to of the General Conditions.

§8.4.5 In addition to the liquidated damages described above, in the event the Contractor fails to complete all work under this Contract by said Scheduled Dates, the Contractor will, at the sole discretion of the Owner, not be permitted to perform any work during normal hours. Such work shall only be performed after hours, Saturdays, Sundays, holidays or periods when the school is unoccupied, at no additional cost to the Owner. This paragraph in no way limits any other rights, or remedies of the Owner under this Contract.

§8.4.6 All costs will be subtracted from payment due the Contractor (or, if the amount due the Contractor for payment is insufficient, any deficiency shall be paid by the Contractor to the Owner).

§8.4.7 This section shall in no way prevent the Owner from enforcing any other remedies it may be entitled to pursuant to the Contract, including the right of termination, and in the cases of termination, any damages suffered by the Owner shall not be considered damages by reason of delay, regardless of the reason for termination

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

§ 9.1.2 Refer to Section 00 2000 Price and Payment Procedure for additional requirements.

§ 9.1.2 If Unit Cost Allowance prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities

causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted. Refer to Section 01 2100.

§ 9.1.3 Notwithstanding anything to the contrary contained in the Contract Documents, the Owner may withhold any payments to the Contractor if and for so long as the Contractor fails to perform any of its obligations or otherwise is in default under any of the Contract Documents; provided, however, that any such hold back shall be limited to an amount sufficient in the reasonable opinion of the Construction Manager to cure any such default or failure of performance by the Contractor.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Construction Manager, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. Refer to Section 01 2000 for Additional Requirements.. This schedule, unless objected to by the Construction Manager, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

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

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and installed. If approved in advance by the Owner, payment may be made for materials and equipment suitably stored on site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such material and equipment or otherwise protect the Owner's interest, and shall include applicable insurance and storage. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Construction Manager to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.2.1 All materials and equipment, including materials and equipment stored on-site but not installed, or stored in secured warehouse will require a bill of lading showing the exact value. upon which partial payments have been made shall become the property of the Owner, but the care and protection of such materials and equipment shall remain the responsibility of the Contractor until incorporation and approved into the Work, including maintaining insurance coverage on a replacement cost basis without voluntary deductible.
Notwithstanding payment by the Owner, all warranties and/or guarantees required by the Contract Documents shall not begin to run until the Contractor has completed its Work.

§ 9.3.2.2 In no case will more than 90% be approved if the item is not installed. Insurance certificates will be provided specific to materials stored (for on-site or offsite items).

§ 9.3.2.3 When Construction Manageer or Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

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

§ 9.3.4 Application for all Payments must be accompanied by certified payroll records and all releases of liens for previous applications **from Contractor and their subcontractors** and a sworn and notarized statement that all subcontractors have been paid to at least **95%** of previously requisitioned sums. In the event a lien is filed on the Owner's property, by any entity, due to the actions of the Contractor, regardless of the relationship between the lien and the work performed on this project all payments will be held in abeyance until such lien is bonded or removed.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

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

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

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

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of

the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

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

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

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor or other Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.
- **.8** failure to comply with scheduled milestone or submittal dates.
- **.9** damages resulting from the Contractor's failure to notify the Architect of errors or inconsistencies between and among the Contract Documents;
- **.10** failure of the Contractor and/or its Subcontractors to comply with the requirements for maintaining record drawings.
- **.11** the Construction Manager's or Architect's discovery or observation of work which has been previously paid for by the Owner which is defective and/or incomplete.
- **.12** such other acts and/or omissions by the Contractor in connection with the performance of its Work that do not comply with the Contract Documents; or
- **.13** the amount requested exceeds the percent completion of work on the Project site(s).

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

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

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

§ 9.6 Progress Payments

§ 9.6.1 Refer to Section 01 2000 Price and Payment Procedures for additional requirements.

§ 9.6.1.1 Payment Period: Submit at intervals stipulated in the Agreement but not more than one per month.

§ 9.6.1.2 Form to be used: AIA G702 and AIA G703.

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

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

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

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

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

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

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

(Paragraph deleted)

§ 9.7 Failure of Payment

§ 9.7.1 If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen business days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within thirty business days after the date established in the Contract Documents, the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon ten business additional days' notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received.

§ 9.8 Substantial Completion

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

§ 9.8.1.1 Contractor shall advise Construction Manager and Architect of pending insurance changeover requirements.

§ 9.8.1.2 Contractor shall obtain and submit releases permitting Construction Manager and Architect unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases

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

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

§ 9.8.3.1 Certificate of Substantial Completion will be issued only after completion of all punch list items or Construction Manager will notify Contractor of items, either punch list or additional items identified by Architect, that must be completed or corrected before a certificate will be issued. After completion of all punch list items submit the following to the Construction Manager:

- **.1** Application for Payment showing 100 percent completion for portion of the Work claimed as substantially completed.
- **.2** Manufacturer's Warranties/guarantees.
- **.3** Contractor's Warrantee **Two (2)** years minimum and extended warrantees.
- **.4** Maintenance agreements, if any.
- **.5** Manifest for disposal of Hazardous Material.
- **.6** Manifest for disposal of material.
- **.7** Test/adjust/balance reports and records.
- **.8** Maintenance Manuals and Instructions Manuals
- **.9** Signed Receipt by Owner's Representative of spare parts and attic stock.
- **.10** Meter readings
- **.11** Start-up performance reports.
- **.12** Changeover information related to Owner's occupancy, use, operation, and maintenance.
- **.13** Advice on shifting insurance coverage.
- **.14** Final photographs of completed punch list items and Architect's punch list certifying all punch list items have been completed with each item signed off by the Construction Manager and Contractor.
- **.15** List of incomplete Work, recognized as exceptions to Architect's "punch list".
- **.16** Removal of temporary facilities and services.
- **.17** Removal of surplus materials, rubbish and similar elements.
- **.18** As Built Drawings.
- **.19** Project Record Documents.
- **.20** DOL Final Completion Form. (PW 200).
- **.21** This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

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

§ 9.8.5 The Certificate of Substantial Completion(AIA G-704) shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of less retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents. The Contractor understands that no retainage will be paid until all work, including punch lists items are complete and submission of all close out documents as listed in Section 01 7800 Closeout Submittals are submitted and approved.

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

(Paragraph deleted)

§ 9.10.11 The Date of Final Completion of the Work is the date all of the Work required under the Contract Documents is completed, all required materials (e.g. as built drawings, operations and maintenance manuals warranties, etc.) have been delivered to the Owner and all applicable licenses, permits, certificates or approvals have been obtained by the Contractor and delivered to the Construction Manager to the extent required by the Contract Documents. Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.1.1 If the Contractor's Work is not accepted by the Construction Manager and Architect 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, but no later than the date of the Final Certificate for Payment.

§ 9.10.1.2 If the Construction Manager and Architect are required to perform more than one final inspection because the Contractor's Work fails to comply with the requirements of the Contract Documents, the amount of compensation paid to the Architect by the Owner for additional services shall be deducted from the final payment to the Contractor

§ 9.10.2 Neither final payment nor any retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) completion of all "punch list" items, including photos, (6) submission of all closeout documents as listed in Section 01 7800 Closeout Submittals (7) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and, (8) Architect's punch list certifying all punch list items have been completed with each item signed off by the Construction Manager and Contractor (9), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.2.1It is understood by the Contractor that the maximum payment due the contractor prior to final payment shall be Ninety (95%) of the Contract amount and the final Five (5%) will be due only after the above is satisfied

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment may be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

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

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

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

§ 9.11 APPLICATIONS FOR PAYMENT WHEN BEHIND SCHEDULE

§ 9.11.1 When the project falls behind schedule the contractor shall demonstrate the actions to be taken to put the project back on schedule.

§ 9.11.1.1 Payments will not be approved until satisfactory evidence is presented to put the project on schedule

§ 9.12 APPLICATION FOR PAYMENT AFTER SCHEDULED COMPLETION DATE

§ 9.12.1 In the event the work is not completed by the schedule date, listed in Section 01 1000 - Summary, and in addition to the other remedies described, the Construction Manager and Architect will not review progress payment requisitions submitted after the construction completion date, and the Owner will not issue any progress payments after that date, until all work is completed.

§ 9.12.2 Only one requisition for work performed, after the construction completion date, may be submitted, and it may be submitted only when all work is complete and a Punch List inspection is conducted; said requisition may be submitted when the work at 100% complete, less 5% retainage.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. Prior to beginning any work the Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager. The Contractor shall make the participation of its Subcontractors in its safety plan and program mandatory. The Contractor and its Subcontractors shall conduct their operations in accordance with the Safety Guides for Construction issued by New York State Education Department ("SED") , DASNY and the Contractor's Safety Plan and Program.

§ 10.2 Safety of Persons and Property

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

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction: and

.4 construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.1.1 The Contractor shall maintain at the project site MSDS documentation for all material brought on site.

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

.1 The work on the project of any other contractors or any property of any other contractors work on the project;

.2 shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement during construction.

§ 10.2.2.1 Any and all fines or citations levied against the Owner, Construction Manager, Architect due to the failure of the Contractor to comply with statutes, ordinances, codes, rules, regulations, or lawful orders 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.

§ 10.2.2.2 Any reference made to rules and regulations promulgated by various governmental agencies with the Specifications or Construction Drawings are for the Contractor's benefit. The issuance of compliance to said regulations by workers employed by the Contractor or by sub-contractors is the sole responsibility of the Contractor; and that, notwithstanding any reference to any rule or regulation, that the Construction Manager, Architect, the Architect's construction observer (Clerk-of-the-Works) or any representative of the Owner is not assuming any duty to provide supervision of construction methods in processes.

.1. Each Contractor shall assign one person from his staff to be on-site safety coordinator.
.2 Each Contractor is solely responsible for overall job site safety, the safety of his employees and the conduct of his work and that of his sub-contractors.
.3 Each Contractor affirms he is fully versed in all State, Federal and local regulations pertaining to safety including OSHA regulations, and pertaining to any and all construction operations
,4 All site personnel have appropriate Department of Labor certification

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

§ 10.2.3.1 The Contractor shall be responsible for all costs incurred by the Owner caused by false security alarms and false fire alarms set off by the Contractor, its Subcontractors, employees, suppliers, officers, directors or servants.

§ 10.2.3.2 All safety equipment including but not limited to hard hats and other personal protective materials and equipment (masks, face shields, gloves, etc.) required for the Contractor to perform its work are to be supplied by the Contractor and/or its Subcontractors.

§ 10.2.3.4 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. For additional indemnity obligations see Section 3.18 of these General Conditions.

§ 10.2.3.5 When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the Work, as necessary, form injury by any cause.

§ 10.2.3.6 Construction areas which are under the control of a Contractor and therefore not occupied by the Owner's 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 any building in which construction is occurring. Periodic inspection and repair of the dust and contaminant barriers must be made to prevent exposure to dust or contaminants.

§ 10.2.3.7 The Contractor's operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when building or affected building spaces are not occupied. The Contractor shall take acoustical abatement measures as needed to minimize the noise produced by its operations and to ensure no disruption to occupied spaces

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.
§ 10.2.4.1 When use or storage of hazardous materials or equipment or unusual construction methods are necessary to promulgate the Work, the Contractor shall give the Construction Manager reasonable advance notice, and shall maintain on the site, a full set of safety instructions relating to all such materials.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, employees, agents, or representatives of any of the above or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Owner shall only be responsible to pay for the services of the laboratory if the material or substance reported by the Contractor is found to be hazardous. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused in whole or in part by negligent acts or omissions of the Owner, anyone directly or indirectly employed by the Owner or anyone for whose acts the Owner may be liable.

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

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

(Paragraph deleted)

§ 10.4 Emergencies

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

"immediately", for the purposes of this paragraph shall mean a time period which is less than the time it would take to notify the Owner's Representative of the emergency.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds.

§ 11.1.1 All insurance purchased by Contractor shall constitute primary insurance and primary coverage for all risks insured and that any other liability insurance that Owner, Construction Manager and Fuller and D'Angelo, P.C. may procure or maintain is secondary and that there shall be no contribution by such insurance until insurance provided by the Contractor is exhausted. All policies shall be provided by insures licensed to conduct business in New York State.

§11.1.1.1 The following insurance coverages and requirements must be provided by the contractor and evidence of same must be certified to the Owner, Owner's Representative and Fuller & D'Angelo, P.C. prior to commencing any work under this **contract,** and original certificates of insurance, shall be furnished prior to the contract signing.

§11.1.1.1 The following insurance coverages and requirements must be provided by the Contractor and evidence of same must be certified to the Owner, Owner's Representative, Construction Manager and the Architect (Fuller & D'Angelo, P.C.) prior to commencing any work under this contract, and original certificates of insurance, shall be furnished prior to the contract signing. The Contractor's coverage shall be primary and non-contributory coverage for the Owner, Owner's Representative, Construction Manager, the Architect (Fuller and D'Angelo, P.C.), and Owner's Board of Education as well as each of their respective officers, members, directors, employees, and volunteers.

§ 11.1.1.2 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to conduct business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by 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 Claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§11.1.2 Certificates of Insurance:

- .1 Each certificate shall include the following clause: It is agreed that prior to any cancellation of, or material change in the policies certified to on this Certificate, 30 days written notice, by certified mail, return receipt requested, shall be sent to the Owner, Owner's Representative and Architect prior to the effective date of such change or cancellation.
- .2 Shall specifically describe the work to be performed by the Contractor that are covered by the liability policies and the job site location.
- .3 Shall include to the fullest extent permitted by law, the Contractor shall, defend, indemnify and hold harmless the Owner, Construction Manager, Architect, their respective Consultants and their respective members, directors, officers, agents, employees, successors, and assigns (collectively "Indemnitees") from and against any and all losses, claims, costs, damages, expenses, and attorneys' fees, arising out of or resulting from the performance of the Work, or by Contractor's breach of this Agreement, except to the extent caused by the sole negligence or willful misconduct of any Indemnitee hereunder.
- .4 The Contractor and each of its Subcontractors and to all Shared Services Contracts (Purchase Order Agreements) shall include the Owner, Construction Manager, Architect and their Consultants as

Additional Insureds on their casualty and commercial liability insurance policies on a primary and non-contributory basis, including a waiver of subrogation, acceptable to Owner, and shall not include any exclusions that limit the scope of coverage beyond that provided to the named insured and the endorsement shall not require a written agreement with the Additional Insureds.

.5 Additional Insured status shall be provided by ISO endorsement CG 20 38 04 13, CG 20 38 (for on-going operations) and CG 20 37 (for product and completed operations). A completed copy of the endorsements must be attached to the Certificate of Insurance. The decision to accept an endorsement rests solely with the Owner.

.6 A copy of the endorsement(s) providing additional insured sections must be attached to the Certificates.

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

.8 Shall use the forms adopted and/or required by the **New York State** Workers' Compensation Board for proof of Workers' Compensation and **NYS** Disability Insurance, an ACORD certificate is not acceptable proof.

.9 Renewal Certificates of Insurance: Renewal Certificates of Insurance must be filed with the Owner, Construction Manager, Architect at least five (5) days prior to the expiration of any policy

§11.1.3 The Contractor acknowledges that failure to obtain such insurance on behalf of the Owner constitutes a material breach of contract and subjects it to liability for damages, indemnification and all other legal remedies available to the Owner. The Contractor is to provide the Owner with a Certificate of Insurance, evidencing the requirements have been met, prior to the commencement of the work or use of the facilities. Failure to provide said insurance shall cause the immediate suspension of all work and possible cancellation of this contract.

(Paragraph deleted)

§11.1.3.1 At the Owner's request, the Contractor shall provide a copy of the declaration page of the liability and umbrella/excess policies with a list of endorsements and forms. If requested, the Contractor will provide the Owner with a copy of the policy endorsements and forms

(Paragraph deleted)

§11.1.4 The Contractor agrees to carry as a minimum the following insurance in such form and with such insurers as are satisfactory to the Owner covering the work hereof:

.1 **Workmen's Compensation Insurance: Statutory Workmen's Compensation Insurance (C-105.2 or U-26.3) and NYS Disability Insurance (DB-120.1)** for all employees coverage as required by the State Law in which the project site is located, and in the state in which the Contractor is domicile, and licensed to do business, and for all of his employees to be engaged in work on the project under this contract, and in case such work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the employees to be engaged in such work. Provide Statuary Limits and Coverages. Proof of coverage must be on the approved specific form, as required by **the New York State Workers' Compensation Board**. ACORD certificates are not acceptable.

.2 **Employers Liability Insurance**: Not less than $1,000,000 for all employees to be engaged in work on the Project.

.3 **Commercial General Liability Insurance** Including Premise/Operations, Independent Contractors, Products and Completed Operations, Broad Form Contractual, Broad Form Property Damage, Broad Form General Liability Endorsement and blanket coverage for underground hazards; X (explosion) C (collapse) U (underground).

Minimum Limits:

Each Occurrence:	$1,000,000.00/$2,000,000.00
General & Product Liability Aggregate:	$2,000,000.00.
Products and Completed Operations	$2,000,000.00
Personal Injury and Advertising:	$1,000,000.00.
Fire Damage Legal:	$50,000.00.
Medical Expenses:	$10,000.00

(General Aggregate to apply on a per project basis).

Other Requirements: No Explosion, Underground, Collapse (XCU) exclusions.

.4 **Bodily injury** including death arising from any occurrence for the period and time for this specific work contract, including any contractual agreement assuming liability of Owner by terms of contract agreement in an amount of not less than the amount as stated above.

a. Coverage and limits required in no way restrict or relieve the Contractor from the full and complete responsibility for all injuries and/or damages and it is suggested that the Contractor consult their agent or broker to be certain their coverage, in form and limits, is sufficient for their needs.

.5 **Automobile Insurance.** Business Automobile liability insurance coverage format shall be as required by the state law in which any and all vehicles are registered, and must include all owned, hired borrowed and non-owned vehicle es in the following amounts:
Minimum limits:

Bodily Injury -	$1,000,000.00 each accident
Property Damage -	$1,000,000.00 each accident
or a combined single limit of	$1,000,000.00

.6 **Conditions of Coverage** Bodily Injury and Property Damage coverage under both General and Automobile Insurance shall include the "occurrence" basis wording. In the event of cancellation of insurance, the Owner shall be given advance notice of 30 days by the insured carrier and such to stipulated in the insurance contract.

.7 **Umbrella/Excess Liability Insurance.** $5 million each Occurrence and Aggregate for general construction and no work at elevation (1 story– 10 feet) or project values less than or equal to $1,000,000. $10 million each Occurrence and Aggregate for high-risk construction, work at elevation (>1 story or 10 feet) or project values greater than $1,000,000. Umbrella/Excess coverage shall be on a follow-form basis .

.8 **Self-Insured Retentions** and insurance policy deductibles shall not exceed $10,000.00 per occurrence.

.9 **Owner Contractor Protective Liability Insurance (OCP):** The Contractor shall purchase and maintain an Owner's Protective Liability policy with the Owner, Owner's Representative, Construction Manager and Fuller & D'Angelo, P.C. as named insured where permitted..
The original and duplicate policy shall be filed with Owner and the policy shall remain in effect until the job is formally accepted by the Owner.

Limits of Liability:

for project up to 1,000,000 and work on 1 story (10 Feet) only:	$1,000,000.00 each occurrence. $2,000,000.00 aggregate
for project over 1,000,001 and work over 1 story (10Feet):	$2,000,000.00 each occurrence $4,000,000.00 aggregate

.10 **Asbestos/Lead/Hazardous Materials Liability 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.
Minimum limits:

$2,000,000 per occurrence/$3,000,000, including products and completed operations. If a retroactive date is used, it must pre-date the inception of the contract

If automobiles are to be 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 section and shall extend for a period of three (3) years following Substantial Completion of the Work.

Said policy shall be endorsed to indicate that the term "Insured" shall include the "Owner" Owner's Representative, Construction Manager and Architects and be deemed to include their authorities, boards, bureaus, departments and officers thereof in their official capacities.

Said policy shall be endorsed to indicate that the Contractor is solely responsible for the premium cost of the policy including any audit adjustments.

Said policy shall contain a 30-day notice of cancellation clause with said notice to be sent to the Owner, Owner's Representative, and Architects by certified mail.

.11 **Builder's Risk:** The Contractor shall purchase and maintain throughout the course of the entire contract, and until final acceptance, a Builders Risk Policy providing a Builder's Risk Coverage Form or Builder's Risk Renovation Form in an amount equal to 100% of the total completed value (including all material and labor costs) and provide coverage for fire, lightning, explosion, extended coverage, vandalism, malicious mischief, windstorm, hail and flood. Must include interest of the Owner and Contractor jointly in a form satisfactory to the Owner.

The coverage format shall be the "Special Coverage" form (all risk) **naming** the Owner and , the Contractor. Loss, if any, shall be payable to the Owner as trustee for all interests. Contractor shall be solely responsible for the cost of any deductible.

.12 **Flood Insurance:** For the work site with minimum limits of $1,000,000 per occurrence/$1,000,000 aggregate, Owner shall be named as an additional insured on the policy.

.13 **Equipment, Tools and Supplies:** By signing this contract, the Contractor agrees and understands that he is solely responsible for all loss to any tools, equipment, or supplies, owned, rented, or leased, stored at or off the site. Further, the Contractor certifies that he has provided or will provide notice to this effect to all subcontractors and suppliers.

.14 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.

.15 **Cyber Insurance:** If requested by the Owner, the Owner will provide and pay for the policy.

(Paragraph deleted)

§11.1.5 Subcontractors Insurance: The Contractor agrees to provide all sub-contractors with a copy of these insurance requirements and further, agrees to require all subcontractors, manufacturers and suppliers to provide evidence of insurance of the same coverage and limits as are required from the Contractor pursuant to Section 11.1.1.4.

§11.1.6 The Contractor shall maintain a separate record of each subcontractors' insurance certificates and said records shall be available for inspection by the Owner, Construction Manager and Architects for a period of 2 years from the date of final acceptance.

§11.1.7 The Contractor shall not permit any subcontractors on the site until acceptable certificates of insurance have been filed and approved

§11.1.8 Waiver of Subrogation: All property insurance policies carried by the Contractor and his subcontractors shall contain a "Waiver of Subrogation" clause (including equipment floaters) to the effect that the Contractor agrees to waive all rights of subrogation against the Owner, Construction Manager and Architect.

§11.1.9 The signing of this contract acknowledges that the Contractors have notified their insurance carriers of the insurance requirements contained in this Article 11.

§11.1.10 Renewal Certificates of Insurance: Renewal Certificates of Insurance must be filed with the Owner, Construction Manager and Architect **at least** 10 days prior to the expiration of any policy

§11.1.11 Job Safety: The Contractor shall assign one person from his staff to be on the job site safety coordinator. The Contractor is solely responsible for overall job site safety, the safety of his employees and the conduct of his work and that of his subcontractors.

§11.1.11.1 The Contractor agrees to cooperate and comply in full of the insurance representatives of the Owner, Construction Manager and Architect. with respect to any safety recommendations or requirements.

§11.1.11.2 The Contractor affirms he is fully versed in all State, Federal and local regulations pertaining to safety including OSHA and Department of Labor regulations, pertaining to his trade and construction operations.

§11.1.12 Products, Completed Operations: The Contractor is required to, and agrees to carry Products and Completed Operations coverage.

§11.1.13 Certificates of Insurance shall be filed annually with the Owner, Construction Manager, Architect and the Contractor shall obtain and record like certificates from his subcontractors. If the Contractor fails to obtain the required certificates of insurance from a subcontractor and a claim is made or suffered, the Contractor shall indemnify, defend and hold harmless the Owner, its Board of Education, employees and volunteers from any and all claims for which the required insurance would have provided coverage. This indemnity obligation is in addition to any other indemnity obligation provided in the Contract Documents and shall survive the termination of the Contract.

§11.1.14 Insurance Carriers: All insurance carriers providing coverage on the project must be **licensed** to conduct business and issue the type of insurer the carrier is providing to the Contractor in the State in which the project is located, and in the State in which the Contractor is domicile. The companies must be **A. M. Best A"** rated or better insurer. This requirement applies to all subcontractors as well.

11.1.15 If at any time, any policy required herein shall be or become unsatisfactory to the Owner, as to form or substance, or if the issuing company shall be or become unsatisfactory, the Contractor, upon written notice from the Owner, shall promptly replace said unsatisfactory insurance.

§11.1.16 If the Contractor fails to provide, maintain or deliver satisfactory insurance during this project, at the election of the Owner, the contract maybe declared suspended, discontinued, or terminated.

§11.1.17 Failure to provide and maintain proper insurance under this contract shall not relieve, nor be construed to conflict with or otherwise limit the contractual obligations of the Contractor

§11.1.18 In the event that any claims, or claims aggregate be in excess of the insured amounts, filed by reasons of any operations under this contract, the Owner, at its sole opinion, may withhold from payments due or to become due the Contractor amounts equal to the excess of such claims, until the Contractor has provided evidence of additional financial security covering such claims, in a form satisfactory to the Owner.

§11.1.19 All the policies of insurance referred to in this Article 11 shall be issued in the names of the Owner, Construction Manager, Architect, Contractor(s), and his subcontractors. Said policy shall be endorsed to indicate that the term "Insured" shall include the Owner, Construction Manager, Architect and be deemed to include their authorities, boards, bureaus, departments and officers thereof in their official capacities. In all cases regarding insurance referred to in these specifications, certificates shall be provided to the Owner, Construction Manager and Architect.

§11.1.19.1. In the event that any of the insurance coverage to be provided by the Contractor to the Owner and Architect contains a deductible or self-insured retention, or the insurance provided by the Owner and Architect contains a deductible or self-insured retention, the Contractor shall indemnify and hold the Owner and the Architect harmless from the payment of such deductible or self-insured retention, for all claims arising from any acts or omissions of Contractor or Contractor's officers, directors, employees, Subcontractors, suppliers or any others engaged by Contractor directly or indirectly to perform Contractor's Work on the Project, which deductible or self-insured retention shall in all circumstances remain the sole obligation and expense of the Contractor

§ 11.1.20 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located. Refer to Section 00 6000 Bonds and Certificates.

§ 11.1.21 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.22 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within ten (10) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide written notice directly to the Owner, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner or Construction Manager shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

(Paragraphs deleted)

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

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

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

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor, Architect, and Construction Manager for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

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

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that

purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner or Construction Manager may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. If prior to the date of Substantial Completion, the Contractor, a subcontractor or anyone for whom either is responsible uses or damages any portion of the Work, 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.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within two (2) years after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The two (2)-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The two (2)-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2 except as to the corrective work performed and subject to the continued existence of any manufacturer's warranty, if applicable

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

§ 13.1.1 This Contract shall be governed by and interpreted in accordance with the substantive laws of the State where the Project is located without recourse to principles of choice of law The venue of any dispute resolution proceedings or actions shall be in the county in which the Project is located.

§ 13.1.1.2 The Contractor shall at all times observe and comply with all Federal, State and Local Laws, rules and regulations and all policies, rules, regulations and protocols of the Owner, in any manner affecting the Work and all such orders as exist at present and those which may be enacted in the future, by bodies or tribunals having jurisdiction or authority over the Work and the Contractor shall indemnify and save harmless the Owner and its Board of Education, Owner's Representative, Construction Manager, Architect, employees, 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 by the Contractor or the Contractor's officers, directors, employees, Subcontractors and suppliers.

§ 13.1.1.3. 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 the Contract Documents unless and until the Contractor has received written consent for the waiver of such compliance from the Owner.

§ 13.1.2 The Contractor specifically agrees, as required by New York 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 Specifications, and any redetermination of the prevailing rate of wages after the Contract is approved shall be deemed to be incorporated therein by reference as of the effective date of redetermination 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, Subdivision 3, as amended; or

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

§ 13.1.3 The Contractor specifically agrees, as required by the provisions of New York Labor Law Section 220-e, as amended, with respect to operations performed within the territorial limits of New York State, that:

.1 In hiring of employees for the performance of work under this Contract or any subcontract hereunder, or for the manufacture, sale or distribution of materials, equipment or supplies hereunder, no Contractor, Subcontractor nor any person acting on behalf of such Contractor or Subcontractor, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates.

.2 No Contractor, Subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this Contract on account of race, creed, color, disability, sex or national origin.

.3 There may be deducted from the amount payable to the Contractor by the Owner under this Contract a penalty of fifty ($50.00) dollars for each person for each calendar day during which such person was discriminated against or intimidated in violation of this Section 13.1.3.

.4 The Contract may be cancelled or terminated and all monies due under the Contract forfeited for a second or any subsequent violation of the terms and conditions set forth in this Section 13.1.3.

§ 13.1.4 The Contractor shall comply with all 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 Board of Education, Construction Manager, Architect, 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 by Contractor or its Subcontractor(s) in connection with the Work of the Contract Documents.

§ 13.1.5 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 age, creed, race, religion, color, sex, national origin, sexual orientation, gender identify or expression, military status, disability, predisposing genetic characteristics, familial status, marital status or status as a victim of domestic violence. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their age, race, creed, religion color, sex, national origin, sexual orientation, gender identify or expression, military status, disability, predisposing genetic characteristics, familial status, marital status or status as a victim of domestic violence. 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 age, creed, race, religion, color, sex, national origin, sexual orientation, gender identify or expression, military status, disability, predisposing genetic characteristics, familial status, marital status or status as a victim of domestic violence.

§ 13.1.6 Dust Hazards - The 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.

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights, Remedies and Written Notice

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law or in equity or by other agreement and such rights and remedies shall survive acceptance of the Contractor's Work and/or any termination of the Contract.

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

§ 13.3.3 Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice. Notice deposited in the mail in accordance with the provisions hereof shall be effective unless otherwise stated in the Contract from and after the fourth (4th) day following the date deposited in a U.S. Mail receptacle or when actually received, whichever is earlier. Notices transmitted by courier service shall be effective the day following posting (or the following Monday, if the day of posting is a Friday or Saturday). Notice given by personal service shall be effective only when received by the party to be notified. All notices to be given to the parties hereto shall be sent to or made at the addresses set forth in the Contract. 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.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Refer to Section 01 4000 Quality Requirements for additional requirements.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor, and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Owner's Representative, Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest Payments due and unpaid under the Contract Documents shall not bear interest. .

§ 13.6 TIME LIMITS ON CLAIMS

§ 13.6.1 The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law,

13.7 LIENS

13.7.1 If the Contractor or any of its subcontractors or suppliers should cause a Mechanic's Lien to be placed upon the property, or Contract, Sum then the Contractor shall be liable for any and all legal or bonding or insurance fees related to the removal of the Mechanic's Lien or the defense of any Mechanic's Lien enforcement or foreclosure proceeding. Such legal or bonding or insurance fees shall also be a deduction by the Owner from any moneys due or to become due to the Contractor.

§ 13.8 SEXUAL HARASSMENT PROHIBITED

§ 13.8.1 Federal and state laws and the policies of the Owner prohibit sexual harassment of employees. Sexual harassment includes any unwelcome sexual advances, requests for sexual favors or other verbal or physical conduct of a sexual nature that create a hostile or offensive working environment for students, employees and volunteers of the Owner and employees, agents, consultants, suppliers, subcontractors and others engaged directly or indirectly by Contractor to perform work on the Projects. The Contractor shall exercise control over its employees, agents, consultants, subcontractors, and suppliers so as to prohibit acts of sexual harassment of students, employees and volunteers of the Owner. In the event the Owner, in its reasonable judgment, determines that the Contractor or its employees, agents, consultants, subcontractors and/or suppliers have committed an act of sexual harassment, upon notice from the Owner, the Contractor shall cause such person to be removed and shall take such other action as may be reasonably necessary to cause such sexual harassment to cease. In the event the Contractor or its employees, agents, Subcontractors or suppliers believes it has been the subject of sexual harassment by the Owner, its elected and appointed officials, students, volunteers, vendors, employees or agents, it shall give notice to the Owner; so, the Owner can take such action as may be reasonably necessary to cause any sexual harassment to cease.

§ 13.9 GENERAL PROVISIONS

§ 13.9.1 Contractor agrees to do all acts and things and to make, execute and deliver such written instruments, as shall from time be reasonably required to carry out the terms and provisions of the Contract Documents.

§ 13.9.2 Contractor is obligated, by virtue of entering into a contract with the Owner, to ensure that absolutely no asbestos containing material is used in conjunction with the Work. It is the Contractor's sole responsibility to provide assurance that no asbestos containing material is built into the construction, nor does any equipment used in the construction contain 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, and to indemnify all their employees, agents, or servants or any third parties including but not limited to the Owner and the Architect, and their respective servants or employees for any costs or damages incurred on account of personal injury or death or property damage caused by, arising out of, or in any way incidental to, or in connection with the performance of the Work hereunder. This provision will be limited only to the extent required by law and shall survive the termination or expiration of the Contract. Refer to Section 01 7800 Closeout Submitials for additional requirements.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

(Paragraph deleted)

§ 14.1.2 If one of the reasons described in Section 14.1.1 exists, the Contractor may, upon seven days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

(Paragraphs deleted)

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** refuses or fails to supply enough properly skilled workers or suitable materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
- **.4** refuses to correct defective work performed by it;
- **.5** fails to satisfy or bond any filed liens against the Owner's property or contract funds, which arise from the performance of the Contractor's Contract.
- **.6** disregards the instructions of the Construction Manager, Architect, or the Owner (when such instructions are based on the requirements of the Contract Documents.
- **.7** breaches any warranty made by the Contractor under or pursuant to the Contract Documents.
- **.8** 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.
- **.9** 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.
- **.10** fails or neglects to prosecute the Work in such a manner to reasonably assure completion within the contract time;
- **.11** fails to keep the Project free from strikes, work stoppages, slowdowns, lockouts or other disruptive activity or
- **.12** otherwise is guilty of substantial breach of a provision of the Contract Documents

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, three days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4;
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished and the Contractor is back charged for all costs incurred by the Owner.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.2.5 The Owner may take over the work for one of the reasons stated in sub-paragraph 14.2.1 after giving the Contractor and the Contractor's Surety, if any, three days' written notice. The Contractor will be back charged for costs incurred by the Owner.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine by giving three (3) days written notice to Contractor describing in general the portion of the Contractor's Work that is suspended, delayed or interrupted and the effective date of such delay, suspension or interruption.

(Paragraphs deleted)

§ 14.3.2 Contractor shall continue to prosecute that portion of its Work that has not been suspended, delayed, or interrupted, and shall properly protect and secure the portion of its Work so suspended, delayed or interrupted.

§ 14.3.3 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 the Contract Documents.

§ 14.3.4 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 by giving written notice to the Contractor, describing the portion of the Contractor's Work to be terminated and the effective date of termination .

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate any part of the Contractor's Work for the Owner's convenience and without cause by giving written notice to the Contractor, describing the portion of the Contractor's Work to be terminated and the effective date of termination.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work;

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts, and purchase orders and enter into no further subcontracts and purchase orders for materials, labor, services or facilities for the Work that is terminated; and.

.4 proceed to complete the performance of the remaining Work on the Contract which has not been so terminated

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; and any deposits or down payments which the Contractor has made pursuant to the Agreement which cannot, in the exercise of good faith and due diligence by the Contractor, be refunded or applied as a credit in the Contractor's favor to other charges, provided, however, that if such deposits or down payments are not refundable, Contractor shall assign the applicable contract, agreement, purchase order, etc. to the Owner who, at its election, may require performance of same. 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 Section 14.4.

§ 14.4.4 In case of a termination pursuant to this Section 14.4, 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.

§ 14.4.5 For the remaining portions of the Contractor's Work which have not been terminated pursuant to this Section 14.4, the terms and conditions of the Contract with the Owner shall remain in full force and effect. The Contractor shall continue to prosecute that portion of its Work that was not terminated pursuant to this Section 14.4.

§ 14.5 Limitation of Owner's Liability

§ 14.5.1 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 it.

§ 14.5.2 The Owner shall not be liable to the Contractor for punitive damages on account of any termination of the Contractor and the Contractor hereby expressly waives its right to claim such damages against the Owner.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents. As is set forth in other provisions of this Contract, delay in the Contractor's ability to complete the work

may, in appropriate circumstances, give rise to a claim for additional time, but will under no circumstances be the basis of a claim for damages.

§ 15.1.2 Time Limits on Claims. The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages. The timelines provided herein for the making of claims shall be a condition precedent to any payment for such claims or the granting of any extension of time. Failure of the Contractor to comply with the time and notice provisions of this Article shall be an absolute bar to making any payment to or extending the time of the Contractor for such claim. All claims of any type seeking any monies, or an extension of time shall be accompanied by full documentation. A claim submittal without full documentation shall be rejected by the Construction Manager and Architect and, if not timely resubmitted within the original claim period, shall be waived. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

.3 The Owner reserves the right to seek damages incurred by the Owner for rental of facilities and loss of use of the Project site in the event the Work is not completed in accordance with the Schedule in the Contract Documents.

.4 This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.1.8 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 the Contract Documents.

§ 15.1.9 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 or omissions of the Owner, Owner's Representative, Construction Manager or the Architect.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Construction Manager will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. A decision by the Construction Manager shall be required as a condition precedent to **the Owner making any payment or granting any extension of time on any** claims between the Contractor and Owner arising prior to the date final payment is due unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render a decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties.

§ 15.2.6 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

(Paragraph deleted)

§ 15.2.7 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

(Paragraph deleted)

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, shall be subject to non-binding mediation

§ 15.3.2 The parties agree that claims, disputes or other matters in question between the parties to this Agreement, arising out of or relating to this Agreement or the breach thereof shall, before the commencement of litigation or a party availing itself of self-help remedies, be submitted to a third party neutral Mediator agreed to by both parties or, if the parties cannot agree, appointed by the American Arbitration Association, at a non-binding Mediation that shall not exceed one calendar day. The parties may be represented by counsel at the Mediation, but no party may engage the Mediator as its representative after the Mediation. Statements made and documents provided or exchanged as part of the Mediation shall be for settlement purposes only and subject the applicable rules or regulations that govern such matters. All mediation shall take place within 30 days of any demand for same of and cost shall be shared by both parties.

(Paragraphs deleted)

§ 15.4 Arbitration

§ 15.4.1 The Contractor and the Owner shall not be obligated to resolve any claim or dispute related to the contract by arbitration; any reference to mediation or arbitration in the Contract Documents is deemed void. If a discrepancy is found in the Contract Documents, this paragraph shall be considered the final say.

(Paragraphs deleted)

ARTICLE 16 - NO DAMAGES FOR DELAY

§16.1 Notwithstanding any other terms or conditions set forth in the Contract Documents, including these General Conditions or any general or supplementary conditions, the contractor agrees to make no claim for damages for delay in the performance of the Work occasioned by any act or omission of the owner or any of its representatives, and agrees that any such claim shall be fully compensated for by an extension of time to complete the work, unless a delay is caused by acts of the Owner constituting 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 notice of such interference. The Contractor hereby expressly assumes the risk of all such delays to the Work, unless the Contract Schedule is extended for excusable delays

§16.2 Contractor agrees and acknowledges that payment for the work may 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 afore said obligations or bonds are no longer available for payment for the work, contractor expressly agrees that it shall be solely entitled to payment for work accomplished until a notice of suspension or cancellation is served upon the Contractor. Contractor expressly waives any and all rights to institute an action, claim, and 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."

SECTION 01 1000
SUMMARY OF CONTRACTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to all Sections of the specifications.

1.2 PROJECT

A. Project Name: HVAC Upgrades And Cafeteria Renovations.

B. Owner's Name: Edgemont School District.

C. Architect's Name: Fuller and D'Angelo, P.C.

D. The Project consists of the HVAC Upgrades And Cafeteria Renovations, Greenville & Seely Place Elementary Schools, 100 Glendale Road & 51 Seely Place, Scarsdale, NY.

1.3 DEFINITIONS

A. Refer to General Conditions AIA 232 -19 and Section 01 4216 for Definitions.

1.4 CONTRACT DESCRIPTION

A. Contract Type: Multiple prime contracts each based on a Stipulated Price as described in Document 00 5200 - Form of Agreement.

B. Contract Type: Multiple contracts are separate contracts, representing significant construction activities, between Owner and separate contractors. Each contract is performed concurrently and coordinated closely with construction activities performed on Project under other contracts. Contracts for this Project include the following

1. Contract #1 General Construction (including asbestos abatement)
2. Contract #2 Plumbing
3. Contract #3 Mechanical
4. Contract #4 Electrical

C. The work of each Contractor is identified in this Project Manual and on the Drawings.

D. Local custom and trade-union jurisdictional settlements do not control the scope of Work included in each prime contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, the affected prime contractor shall promptly negotiate a reasonable settlement to avoid or minimize the pending interruption and delays.

E. If it becomes necessary to refer to the contract documents to determine which prime Contract includes a specific element of required work, begin by referring to the prime Contracts, themselves; then, if a determination cannot be made from the prime Contracts, refer, in the following order, to the General Conditions, if any, this section of the Specifications, followed by the other Division-l sections and finally with the Drawings and other Sections of the Specifications.

F. If, after referring to the contract documents, it cannot be clearly determined which prime Contractor will perform a specific item of required work, then, that item of work will be brought to the Owner's Representative attention in writing for determination.

G. Summary by References: Work of the contract can be summarized by reference to the Contract, General Conditions, Instructions to Bidders , Specification Sections, Drawings, or Addenda issued subsequent to the initial printing of this Project Manual, and including but not necessarily limited to printed material referenced by any of these. It is recognized that the work of the Contract is unavoidably affected or influenced by governing regulations, natural phenomenon, including weather conditions, and other forces outside the contract documents.

1.5 RELATED REQUIREMENTS

A. Section 00 5200 - Agreement Form: Contract Sum, retainages.

B. Section 00 7200 - General Conditions : Additional requirements for progress payments and Changes in the Work.

C. Section 01 1000 - Summary of Contracts for Sequence of Work.

D. Section 01 2000 - Price and Payment Procedures.

E. Section 01 2100 - Allowances.

F. Section 01 2300 - Alternates: Payment procedures relating to alternates, if any.

G. Section 01 3553 - Site Safety and Security Procedures.

H. Section 01 5000 - Temporary Facilities and Controls.

I. Section 01 7000 - Execution.

J. Section 01 7900 - Demonstration and Training

K. Section 01 9113 - General Commissioning Requirements

1.6 JURISDICTIONAL DISPUTES

A. It is not the intention of these specifications to transgress the jurisdictional arrangements regarding the division of work between the several trades. Should it appear, however, that these specifications imply that other trades are to perform work which is claimed by any other trades, each Contractor shall notify the Architect and Construction Manager of such fact when submitting his proposal, indicating the additional amount required to include the work in question in the Base Bid. In the event that no such notification is received prior to an acceptance of the Contractor's Proposal, it will be construed that the specifications imply nothing which is unacceptable to the various trades and no extra payments on this account will be granted to any Contractor during the progress of the job.

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

C. If the Contractor has engaged the services of workers and/or subcontractor 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 Owner, Owner’s Representative, and Architect, 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.

D. The Contractor shall ensure that its work continues uninterrupted during the labor dispute and will be liable to the Owner for all damages suffered by the Owner occurring as a result of work stoppages, slowdowns, disputes or strikes

1.7 SUBCONTRACTORS/SUPPLIERS

A. Submittal of Primary Sub Contractors and Suppliers include but not limited to the following:
   1. Construction Contractor:
      a. Asbestos Abatement
      b. Excavation.
      c. Concrete.
      d. Concrete Supplier
      e. Steel, (detailer, fabricator and erector).

f. Roofing.
g. Steel Doors and Frames.
h. FRP and AMP supplier and installer.
i. Hardware Supplier and Installer.
j. Gypsum Wallboard Assemblies
k. Acoustical Tile.
l. Resilient Flooring
m. Ceramic Tile.
n. Painting
o. Food Service

B. Plumbing Contractor:
1. Plumbing Fixture Supplier.
2. Plumbing equipment/Suppliers.
3. Piping.
4. Insulation

C. HVAC Contractor:
1. HVAC Equipment/Suppliers.
2. Ductwork.
3. Piping.
4. Insulation
5. ATC.

D. Electrical Contractor:
1. Fire Alarm Sub Contractor
2. Switchboard/Panelboards.
3. Lighting Fixture Supplier.

1.8 DESCRIPTION OF ALTERATIONS WORK

A. Scope of removal work is shown on drawings.

B. Scope of alterations work is indicated on drawings.

C. Plumbing: Alter existing system and add new construction, keeping existing in operation.

D. HVAC: Alter existing system and add new construction, keeping existing in operation.

E. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.

F. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.

G. Security System: Alter existing system and add new construction, keeping existing in operation.

1.9 Edgemont School District will remove and re-install the following items before start of work:

A. Loose furniture, computers, loose books etc.

1.10 OWNER OCCUPANCY

A. Edgemont School District intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Edgemont School District intends to occupy the Project upon Substantial Completion.

C. Edgemont School District intends to occupy a certain portion of the Project prior to the completion date for the conduct of normal operations.

D. Cooperate with Owner’s representative and Architect to minimize conflict and to facilitate Edgemont School District's operations.

1.11 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site and premises to allow:
   1. Edgemont School District occupancy.
   2. Work by Others.
   3. Work by Edgemont School District.
   4. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Edgemont School District:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without approval by the Owner's Representative.

D. Existing building spaces may not be used for storage unless approved by the Owner's Representative or Construction Manager's.

E. Time Restrictions.

F. Contractors shall comply with Local Noise Ordinance. Work disrupting the community must be performed with the following hours:
   1. Monday thru Friday: 8 AM to 8 PM.
   2. Weekends/ Holidays: 9 AM to 6 PM.

G. Construction deliveries shall not occur during the hours of 7:30 AM and 9:00 AM and 2:00 PM and 3:00 PM, when school buses are arriving or leaving the school grounds.

H. During the entire construction period the Prime Contractors shall have the use of the premises for construction operations, including use of the site as indicated in Sequencce of Work and work time included in this section.
   1. General: Limitations on site usage as well as specific requirements that impact utilization are indicated on the drawings and/or by other contract documents. In addition to these limitations and requirements, the Prime Contractors shall administer allocation of available space equitably among the separate prime or sub and other entities needing access and space, so as to produce the best overall efficiency in performance of the total work of the project. Each Prime Contractor shall schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.
   2. Prime Contractors shall limit their use of the premises to the work indicated, so as to allow for Owner occupancy and use by the public during the period when the Owner occupies the building.
   3. Prime Contractors shall maintain clear and unobstructed paths of exit discharge from all existing exits.
   4. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner's Representative, Owner's employees, emergency vehicles, and public at all time. Do not use these areas for parking or storage of materials.
   5. Lock automotive type vehicles such as passenger cars and trucks and other types of mechanized and motorized construction equipment, when parked and unattended, to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

I. Only materials and equipment, which are to be used directly in the work, shall be brought to and stored on the project site by the Contractor. After equipment is no longer required for the work, it shall be promptly removed from the project site. Protection of construction materials and equipment stored at the project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractors.

J. Site work shall be scheduled and coordinated with Owner's Representative and Construction Manager . The Owner decisions shall be final and binding on all contractors.

1. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction

K. The Contractor(s) and any entity for which the Contractor(s) is responsible, shall not erect any sign on the Project site without the prior written consent of the Owner's Representative which may be withheld in the sole discretion of the Owner.

L. Contractor shall ensure that the work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the work and all adjacent areas. The work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitation of any other provision of the Contract Documents, each contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of:

1. Any areas and buildings adjacent to the site of the work or;
2. The Building in the event of partial occupancy as more..

M. Without prior approval of the Owner's Representative, each Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitations, lavatories, toilets, entrances and parking areas other than those designated by the Owner's Representative. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with the rules and regulations promulgated by the Owner's Representative in connection with the use and occupancy of the Project Site, and the Building, as amended from time to time. The Contractor shall immediately notify the Owner's Representative in writing if during the performance of the 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 alternatives through which the same results intended by such portions of the rules and regulations can be achieved. The Owner's Representative may, in the Owner's Representative's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirements of the rules and regulations. The Contractor shall also comply with all insurance requirements, applicable to use, and occupancy of the Project Site and the Building.

N. Maintain the existing building in a safe and weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period. When work is scheduled after hours clean and remove all temporary barriers and protection so that the building can be occupied the following day when normal building occupancy will occur.

O. Keep public areas such as hallways, stairs, elevator lobbies, and toilet rooms free from accumulation of waste material, rubbish or construction debris.

P. Smoking, drinking of alcoholic beverages or open fires will not be permitted on the project site.

Q. Utility Outages and Shutdown:

1. Limit disruptions, shut downs, switch overs, etc. of utility services to hours the building is unoccupied, Saturdays, Sunday and/or holidays.
2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers, fire alarm system, electrical, data, and heating system, without 7 days notice to Owner's Representative and Construction Manager and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.

1.12 AVAILABILITY OF EXISTING BUILDING

A. The existing building work areas will be available to the Contractor(s) as follows:

1. Award of Contract thru Construction:
   a. June 23, 2023 3:30 PM thru 10:30 PM Monday thru Friday if access into the facility is required.
   b. June 26, 2023 thru August 31, 2023: 7:00 AM thru 4:30 PM Monday thru Friday (if later hours are needed, the contractor can request auhorization from the Owner through the CM).

2. September 1, 2023 thru July 31, 2023 (Punch List / Closeout Duration)
    a. 3:30 PM thru 10:30- PM Monday thru Friday only when programs and school occupancy are not disrupted and with the approval of the Owner's Representative.
3. Construction operations which create dust, noise or fumes, particularly welding operations shall be schedule after school hours, when approved by the Owner's Representative.
4. Any work that occurs past the punch list phase, due to long-lead times must be done between the hours of 3:30 PM thru 10:30 PM

B. Upon request by the Contractor, the building may be made available, at the discretion of the Owner's Representative and at the Cost to the Contractor, during such times as are allowed by local noise ordnance, in addition to the above listed hours. A request for use during these off-regular hours must be made at least two (2) days before the use. Such off-hours may include Saturdays, and Holidays.
1. If the Contractor requests the use of the facility for off-hours to maintain the scheduled completion date, the Contractor shall pay all additional costs in connection with opening, providing security and project management expenses incurred with no costs to the Owner's Representative. All expenses shall be deducted from the Contractors contract price. Comply with other portions of this Section.
2. Weekend, Holiday and Night Work:
    a. The contractor shall make no claim for delay for the inability of the Owner to make the site available for off-hours work. Should the Owner make the site available during these hours at the contractor's request, the cost will be borne by the Contractor.

C. ALL CONTRACTORS SHALL BE REQUIRED TO PERFORM SCHEDULED WORK WITHIN THE EXISTING BUILDING ONLY DURING THE TIME PERIODS INDICATED AND SHALL INCLUDE IN THE BID ALL COSTS FOR LABOR, MATERIAL, ETC. INCLUDING PREMIUM TIME TO PERFORM THE WORK, PER PHASE PER TIME PERIOD.

1.13 COMPLETION OF WORK AFTER SCHEDULED COMPLETION DATE

A. Contractor(s) shall perform work only within these limitations and all manpower, equipment, etc., shall be provided as required to complete the work as per schedule. In the event the contractor does not complete the work as scheduled all work to be performed shall be performed after 4:30 PM when the building is unoccupied and approved by the Owner's Representative. All costs shall be borne by the Contractor.

B. The Contractor shall prepare a progress schedule in detail listing items of work, sections of building and the time required for each.

C. The Contractor shall provide necessary manpower, equipment, etc., as required to maintain schedule developed within the time limitations as described above.

D. School Calender is available on the Owner's web site. Calendar is subject to modifications for civil service holidays, changes in education programs, snow days, etc.

1.14 SEQUENCE of WORK

A. Start Date: Letter of Award of Contract: **(Note Sequence of Work applies to both building simultaneous).**

B. Construct Work in phases during the construction period:
1. Phase 1: Administrative.
    a. Start Date: Letter of Award
    b. Tasks: Schedule of Values, Progress Schedule, Contracts, Bonds and Insurance, Field verification of existing conditions, and Submittals
    c. Completion Phase1: August 31, 2023
2. Phase 2: Seely Park ES.
    a. Asbestos Abatement
    b. Start Date: June 26, 2023
    c. Completion Date: July 6, 2023
3. Phase 3: Seely Park ES.

a. Tasks: Start Construction
b. Start Date: June 26, 2023 (Work in preparation of the summer may be alloned o 2nd shift, once approved by the Owner.
c. August 31, 2023

4. Phase 4: Greenville ES.
   a. Tasks: Start Construction
   b. Start Date: June 26, 2023
   c. Completion Date: August 31, 2023
5. Phase 5: Fabrication and Delivery Mechanical Equipment.
   a. Tasks: Approval of Critical or Long Lead Item Shop Drawings
   b. Start Date: Letter of Award
   c. Completion Phase 5: 30 Calendar Days
6. Phase 6: Installation Mechanical Equipment (new or temporary).
   a. Tasks: Removals and Installation
   b. Completion Phase 6: August 31, 2023
7. Phase 7: Punch List:.
   a. Start Date: Septembr 1, 2023
   b. Completion Phase: September 15, 2023
8. Phase :": Closeout.
   a. Start Date: September 16, 2023
   b. Completion Phase: October 1, 2023

C. COVID-19

1. Due to the ongoing COVIS-19 pandemic and the resulting uncertainty with regard to (a) when the Owner's schools will be in session during 2023, (b) what restrictions, if any, will be applicable to construction activities on the Owner's property due to State, Federal or Local orders, laws, regulations or rules related to the COVIS-19 pandemic (including but not limited to social distancing, cleaning and disinfection requirements) and (c) the duration of any restrictions imposed on construction activities, the Owner may modify the construction schedule set forth in the Contract Documents and the Contractor acknowledges and agrees that there shall be no additional compensation paid by the Owner for schedule modifications caused directly or indirectly by the COVIS-19 pandemic. The Contractor further acknowledges and agrees that the sole remedy for any schedule modifications caused directly or indirectly by the COVIS-19 pandemic shall be an extension of time, if warranted.
2. In the event that due to the ongoing COVID-19 and school continuing to be **not** in session, the facilities will be made available to the Contactor earlier than the proposed schedule; subject to any restrictions imposed by Federal, State or Local laws, regulations and rules. The completion dates will remain unchanged.

1.15 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

A. Unless otherwise noted, **ALL Provisions of Division 00 and 01 listed below apply to all contracts.** Specific items of work listed under individual contract descriptions constitute exceptions.

B. **DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENT**

00 0115	LIST OF DRAWING SHEETS
00 2113	INSTRUCTIONS TO BIDDERS
00 2115	RFI FORM
00 4100	BID FORM - CONTRACT #1 GENERAL CONSTRUCTION CONTRACTOR
00 4110	BID FORM – CONTRACT #2 PLUMBING CONTRACTOR
00 4120	BID FORM – CONTRACT #3 HVAC CONTRACTOR
00 4130	BID FORM – CONTRACT #4 ELECTRICAL CONTRACTOR

00 4301	BID FORM SUPPLEMENTS COVER SHEET
00 4401	QUALIFICATIONS OF BIDDERS
00 4402	HOLD HARMLESS AGREEMENT
00 4460	CERTIFICATION OF COMPLIANCE WITH THE IRAN DISINVESTMENT ACT
00 4470	DECLARATION OF BIDDER'S INABILITY TO PROVIDE CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT.
00 4476	INSURANCE CERTIFICATION
00 5200	FORM OF AGREEMENT
00 6000	BONDS AND CERTIFICATES
00 7200	GENERAL CONDITIONS

C. **DIVISION 01 - GENERAL REQUIREMENTS**

- 01 1000 SUMMARY OF CONTRACT
- 01 2000 PRICE AND PAYMENT PROCEDURES
- 01 2005 PARTIAL RELEASE OF LIEN
- 01 2100 ALLOWANCES
- 01 2500 SUBSTITUTION PROCEDURES
- 01 3000 ADMINISTRATIVE REQUIREMENTS
- 01 3216 CONSTRUCTION PROGRESS SCHEDULE
- 01 3306 NON DISCRIMINATION CLAUSES
- 01 3307 SED SPECIAL REQUIREMENTS
- 01 3553 SITE SAFETY AND SECURITY PROCEDURES
- 01 3554 PREVAILING WAGE RATES
- 01 4000 QUALITY REQUIREMENTS
- 01 4100 REGULATORY REQUIREMENTS
- 01 4216 DEFINITIONS
- 01 4219 REFERENCE STANDARDS
- 01 4516.13 CONTRACTOR QUALITY CONTROL
- 01 4533 CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES
- 01 5000 TEMPORARY FACILITIES AND CONTROLS
- 01 5213 FIELD OFFICE AND SHEDS
- 01 5500 VEHICULAR ACCESS AND PARKING
- 01 6000 PRODUCT REQUIREMENTS
- 01 6116 VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS
- 01 7000 EXECUTION
- 01 7330 SELECTIVE REMOVALS
- 01 7600 PROCEDURES AND SPECIAL CONDITIONS FOR SEPARATE PRIME CONTRACTS
- 01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
- 01 7800 CLOSEOUT SUBMITTALS
- 01 7900 DEMONSTRATION AND TRAINING
- 01 9113 GENERAL COMMISSIONING REQUIREMENTS

1.16 CONTRACT #1 - GENERAL CONSTRUCTION

A. The work of the General Construction Contract #1 includes but not limited to the following:

1. DIVISION 02 - EXISTING CONDITIONS
   a. 02 8070 ASBESTOS ABATEMENT SUMMARY OF WORK

b. 02 8071 ASBESTOS ABATEMENT REGULATORY REQUIREMENTS
c. 02 8073 ASBESTOS ABATEMENT SUBMITTALS
d. 02 8073.01 ASBESTOS ABATEMENT SUBMITTAL COVER SHEET
e. 02 8074 ASBESTOS ABATEMENT TESTING LABORATORY SERVICES QUALITY CONTROL
f. 02 8075 - ASBESTOS ABATEMENT TEMPORARY FACILITIES
g. 02 8078 - ASBESTOS ABATEMENT SITE SECURITY
h. 02 8079 - ASBESTOS ABATEMENT EMERGENCY PLANNING
i. 02 8080 - ASBESTOS ABATEMENT PERSONNEL PROTECTION
j. 02 8084 - ASBESTOS ABATEMENT MAINTENANCE OF RECORDS
k. 02 8086 - ASBESTOS ABATEMENT WASTE DISPOSAL PROCEDURES
l. 02 8087 - ASBESTOS ABATEMENT RESTORING THE WORK AREA AND SYSTEMS
m. 02 8090 - ASBESTOS ABATEMENT CLEANING UP

2. DIVISION 03 CONCRETE
   a. 03 3000 CAST-IN-PLACE CONCRETE
   b. 03 5400 CAST UNDERLAYMENT
3. DIVISION 04 MASONRY
   a. 04 0100 MAINTENANCE OF MASONRY
   b. 04 2000 UNIT MASONRY
4. DIVISION 05 - METALS
   a. 05 1200 STRUCTURAL STEEL
   b. 05 4000 COLD-FORMED METAL FRAMING
   c. 05 5000 METAL FABRICATIONS
   d. 05 5100 METAL STAIRS
   e. 05 5213 PIPE AND TUBE RAILINGS
5. DIVISION 06 – WOOD, PLASTIC AND COMPOSITES
   a. 06 1000 ROUGH CARPENTRY
   b. 06 1010 ROOF RELATED ROUGH CARPENTRY
6. DIVISION 07 - THERMAL AND MOISTURE PROTECTION
   a. 07 2100 THERMAL INSULATION
   b. 07 5010 MODIFICATIONS TO EXISTING ROOFING
   c. 07 5323 EPDM ROOFING
   d. 07 6200 SHEET METAL FLASHINGS & SPECIALTIES
   e. 07 7123 MANUFACTURED GUTTERS AND DOWNSPOUTS
   f. 07 7200 ROOF ACCESSORIES
   g. 07 8400 FIRESTOPPING
   h. 07 9200 JOINT SEALANTS
7. DIVISION 08 - OPENINGS
   a. 08 1113 HOLLOW METAL DOORS AND FRAMES
   b. 08 1613 FIBERGLASS DOORS AND ALUMINUM FRAMES
   c. 08 3100 ACCESS DOORS
   d. 08 7100 DOOR HARDWARE
   e. 08 7100.01 DOOR HARDWARE SCHEDULE
   f. 08 8717 SAFETY AND SECURITY GLAZING FILMS
   g. 08 8000 GLAZING
   h. 08 9100 LOUVERS
8. DIVISION 09 - FINISHES

a. 09 2116 GYPSUM BOARD ASSEMBLIES
b. 09 2662 GYPSUM SHEATHING
c. 09 3000 TILING
d. 09 5100 ACOUSTICAL CEILINGS
e. 09 6500 RESILIENT FLOORING
f. 09 7700 PLASTIC LAMINATE WALL SURFACES
g. 09 9113 EXTERIOR PAINTING
h. 09 9123 INTERIOR PAINTING

9. DIVISION 10 - SPECIALTIES
   a. 10 1400 SIGNAGE
   b. 10 4400 FIRE PROTECTION SPECIALTIES
10. DIVISION 11 - EQUIPMENT
   a. 11 4000 FOOD SERVICE EQUIPMENT
11. DIVISION 12 - FURNISHINGS
   a. 12 3600 SOLID SURFACING WINDOW SILLS
12. DIVISION 31 - EARTHWORK
   a. 31 1000 SITE PREPARATION
   b. 31 2316 EXCAVATION
13. DIVISION 32 - EXTERIOR IMPROVEMENTS
   a. 32 1313 CONCRETE PAVING AND CURBS
   b. 32 9210 RESTORATION OF TURF AREAS

B. **Special Notes: CONTRACT - #1 - GENERAL CONSTRUCTION**

1. Access doors furnished by trade requiring access; installation by General Contractor in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.
2. All existing ceiling removal /replacements necessary to install General Contractor work will be by General Contractor including temporary support for all lighting fixtures, smoke detectors, etc.
3. General Contractor and subcontractors will not be allowed to use existing or new plumbing fixtures to wash out mortar pans, grout, adhesives, etc.
4. All new roof curbs are supplied by Mechanical Contractor and installed by General Contractor. Cutting penetrations, steel support, and temporary weather protection by General Contractor. Curbs will be flashed / watertight in accordance with roofing section. Hole patching (structural, EPDM, etc.) for roof areas which result from Mechanical demolition of existing rooftop units will be by Contract for General Contractor.
5. General Contractor will restore / patch any finishes damaged by their abatement subcontractor's protections, tape, etc.
6. General Contractor is responsible to provide negative air machines to ventilate all work areas during tasks involving odors, dust, fumes (epoxy floor, painting, etc.)
7. Exterior wall louvers for mechanical items shall be furnished and installed by General Contractor.
8. Within the existing building all cutting of all interior slabs, excavation, utility trenching, bedding, warning tape, backfill and finishing shall be performed by the each Contractor. General Contractor shall provide final finish where noted.
9. The Owner shall have first refusal rights for all existing kitchen appliances to be removed where items are chosen to be salvaged.
10. After removals of rooftop equipment General Contractor shall make existing roof watertight. Coordinate with all trades.

1.17 CONTRACT #2 - PLUMBING

A. **Work in the Plumbing Contractor Contract #2 includes, but is not limited to, the following:**

1. DIVISION 03 - CONCRETE

a. 03 3000 CAST-IN-PLACE CONCRETE

2. DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
   a. 06 1000 ROUGH CARPENTRY
3. DIVISION 07 - THERMAL AND MOISTURE PROTECTION
   a. 07 8400 FIRESTOPPING
   b. 07 9200 JOINT SEALANTS
4. DIVISION 09 - FINISHES
   a. 09 5100 ACOUSTICAL CEILINGS
5. DIVISION 22 - PLUMBING
6. 22 1116 DOMESTIC WATER PIPING SPES/GVES
7. 22 1316 SANITARY WASTE AND VENT PIPING SPES/GVES
8. 22 1319 SANITARY WASTE PIPING SPECIALTIES SPES/GVES
9. 23 1123 FACILITY NATURAL GAS PIPING
10. DIVISION 31 - EARTHWORK
    a. 31 2316 EXCAVATION

B. **Special Notes: CONTRACT - #2 for - PLUMBING CONTRACTOR**

1. Any wood blocking for Plumbing Contract, by Plumbing Contractor.
2. All existing ceiling removal / replacements necessary to install new Plumbing Contractor work will be by Plumbing Contractor unless otherwise noted.
3. Access doors furnished by trade requiring access; installation by General Contractor. in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the Contractor requiring access.
4. Cutting of all interior slabs, excavation, utility trenching, bedding, warning tape, backfill, patching and finishing shall be performed by each Contractor. General Contractor shall provide final finish only were noted.
5. Interior excavation, utility trenching, bedding, warning tape, backfill and concrete slab replacement shall be performed by the Plumbing Contractor. Plumbing Contractor shall patch 1/8" below finish floor for General Contractor's final finishes. Plumbing Contractor is responsible for cleaning/flushing/purging, capping of piping etc. for abandoned utility(s).
6. Plumbing Contractor shall install an inflatable ball in all new plumbing fixtures to prevent construction debris or grout from entering sub-slab piping. Ball will be deflated / removed at the conclusion of the project as directed by the CM.
7. Plumbing Contractor will install sealant around perimeter of all toilet / plumbing fixtures.
8. Coordinate roof top removals with the General Contractor to maintain the building watertight.
9. Interior housekeeping pads for Plumbing Equipment shall be removed by the Plumbing Contractor.
10. Refer to food service equipment specifications section 11-4000 for coordination of work items.

1.18 CONTRACT #3 - MECHANICAL

A. **Work in the Mechanical Contract #3 includes, but is not limited to, the following:**

1. DIVISION 03 - CONCRETE
   a. 03 3000 CAST-IN-PLACE CONCRETE
2. DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
   a. 06 1000 ROUGH CARPENTRY
   b. 06 1010 ROOF RELATED ROUGH CARPENTRY
3. DIVISION 07 - THERMAL AND MOISTURE PROTECTION
   a. 07 8400 FIRESTOPPING
   b. 07 9200 JOINT SEALANTS
4. DIVISION 09 - FINISHES
   a. 09 5100 ACOUSTICAL CEILINGS

DIVISION 23 - MECHANICAL			
1.	23 0500	BASIC MECHANICAL MATERIALS AND METHOD	SPES/GVES
2.	23 0519	METERS AND GAUGES FOR HVAC PIPING	SPES/GVES
3.	23 0523	GENERAL DUTY VALVES FOR HVAC PIPING	SPES/GVES
4.	23 0529	HANGERS AND SUPPORTS FOR HVAC PIPING	SPES/GVES
5.	23 0548	VIBRATION CONTROLS FOR HVAC PIPING	SPES/GVES
6.	23 0553	IDENTIFICATION FOR HVAC PIPING	SPES/GVES
7.	23 0593	TESTING, ADJUSTING AND BALANCING FOR HVAC	SPES/GVES
8.	23 0715	HVAC DUCT INSULATION	SPES/GVES
9.	23 0719	HVAC PIPING INSULATION	SPES/GVES
10.	23 0900	HVAC INSTRUMENTATION & CONTROLS	SPES/GVES
11.	23 0993	SEQUENCE OF OPERATIONS FOR HVAC EQUIPMENT	SPES/GVES
12.	23 1123	FACILITY NATURAL GAS PIPING	SPES/GVES
13.	23 2113	HYDRONIC PIPING	SPES
14.	23 2116	HYDRONIC PIPING SPECIALTIES	SPES
15.	23 2123	HYDRONIC PUMPS	SPES
16.	23 2213	STEAM AND CONDENSATE HEATING PIPING	GVES
17.	23 2216	STEAM AND CONDENSATE HEATING PIPING SPECIALTIES	GVES
18.	23 2300	REFRIGERANT PIPING	SPES
19.	23 3113	METAL DUCTS	SPES/GVES
20.	23 3300	DUCT ACCESSORIES	SPES/GVES
21.	23 3423	HVAC POWER VENTILATORS	SPES/GVES
22.	23 3713	DIFFUSERS, REGISTERS AND GRILLES	SPES/GVES
23.	23 6500	COOLING TOWERS	SPES/GVES
24.	23 7200	AIR TO AIR ENERGY RECOVERY EQUIPMENT	SPES
25.	23 7417	PACKAGED ROOFTOP AIR CONDITIONING UNITS	SPES
	23 8129	VARIABLE REFRIGERANT FLOW HVAC SYSTEMS	SPES
DIVISION 31		EARTHWORK	
1.	31 23116	EXCAVATION	

B. **Special Notes: CONTRACT #3 - MECHANICAL CONTRACTOR**

1. Any wood blocking for HVAC Contract items by HVAC Contractor.
2. All existing ceiling removal / replacements necessary to install new HVAC Contract work will be by the HVAC Contractor unless otherwise noted. Temporary supports for items to remain shall be by the HVAC Contractor.
3. Interior housekeeping pads for HVAC equipment by HVAC Contractor.
4. Access doors furnished by trade requiring access; installation by General Contractor in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.
5. Disconnects, Motor starters, etc. supplied by HVAC Contractor shall be installed by Electrical Contractor, unless noted otherwise.
6. If new mechanical units are too large to fit through existing doorways the mechanical contractor will either disassemble equipment into sections, or remove masonry to enlarge opening and reconstruct to match (at no additional costs to Owner). HVAC Contractor shall notify Owner's representative of proposed removals prior to removal. Owner's representative and Architect shall review for structural and other concerns. Removals shall not proceed without Owner's representative and Architect prior review and written approval. HVAC Contractor shall be responsible for all additional costs incurred by the Architect review including structural analysis.

7. All new roof curbs and portals to be supplied by HVAC Contractor (installed by General Construction Contractor).
8. Any interior exhaust grilles or wall louvers for mechanical items are by HVAC Contractor including opening, lintels, caulking, etc.
9. Cutting of all interior slabs, excavation, utility trenching, bedding, warning tape, backfill, patching and finishing shall be performed by each Contractor. General Contractor shall provide final finish where noted.
10. Interior excavation, utility trenching, bedding, warning tape, backfill and concrete slab replacement shall be performed by the HVAC. HVAC Contractor shall patch 1/8" below the finish for General Contractors final finishes. Contractor. The HVAC Contractor is responsible for cleaning/flushing/purging, capping of piping etc. for abandoned utility(s).
11. Coordinate roof top removals with the General Contractor to maintain the building watertight.
12. Refer to Food Service Equipment specifications section 11-400 for coordination of work items.

1.19 CONTRACT #4 - ELECTRICAL CONTRACTOR

A. **Work in the Electrical Contract #4 includes, but is not limited to, the following:**

1. DIVISION 03 - CONCRETE
   a. 03 3000 CAST-IN-PLACE CONCRETE
2. DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
   a. 06 1000 ROUGH CARPENTRY
3. DIVISION 07 - THERMAL AND MOISTURE PROTECTION
   a. 07 8400 FIRESTOPPING
   b. 07 9200 JOINT SEALANTS
4. DIVISION 09 - FINISHES
   a. 09 5100 ACOUSTICAL CEILINGS
5. DIVISION 26 - ELECTRICAL
   a. 26 0519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
   b. 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
   c. 26 0529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
   d. 26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
   e. 26 0544 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
   f. 26 0553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
   g. 26 2416 PANELBOARDS
   h. 26 2726 WIRING DEVICES
   i. 26 2816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

   DIVISION 28 – ELECTRONIC SAFETY and SECURITY
   a. 28 4621 ADDRESSABLE FIRE-ALARM SYSTEMS

   DIVISION 31 - EARTHWORK
   a. 31 2316 EXCAVATION

B. **Special notes: - CONTRACT #4 ELECTRICAL**

1. VFD's, disconnects, motor starters which are supplied by Mechanical Contractor will be installed by Electrical Contractor unless noted otherwise.
2. All existing ceiling removal / replacement necessary to install new electrical work to be by the Electrical Contractor unless otherwise noted. Temporary supports for light fixtures, smoke detectors, etc. to remain shall be by the Electrical Contractor.
3. Access doors furnished by trade requiring access; installation by for General Contractor. in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the Contractor requiring access.

4. Interior housekeeping pads for electrical equipment by Electrical Contractor.
5. Cutting of all interior slabs, excavation, utility trenching, bedding, warning tape, backfill, patching and finishing shall be performed by the each Contractor.
6. Coordinate rooftop removals with General Contractor to maintain building watertight.
7. Interior excavation, utility trenching, bedding, warning tape, backfill and concrete slab replacement shall be performed by the Electrical Contractor. The Electrical Contractor shall patch 1/8" below finish floor for General Contractor final finishes. The Electrical Contractor is responsible for cleaning, flushing, purging, capping of piping etc. for abandoned utility(s).
8. If the electrical switchgear, panels are too large to fit through existing openings, Electrical Contractor will remove masonry to enlarge the opening and reconstruction to match (at no additional cost to Owner). Electrical Contractor shall notify Owner's Representative of proposed removals prior to removal. Owner's Representative and Architect shall review for structural and other concerns. Removals shall not proceed without Owner's Representative and Architect prior review and written approval. Electrical Contractor shall be responsible for all additional costs incurred by the Owner's Representative and Architect review including structural analysis.
9. Any wood blocking or panel backboards for electrical items by Electrical Contractor.
10. Electric Contractor will tie up and secure with zip ties or J hooks, 5' oc, any existing cabling or wiring which sags below ceiling after any ceiling removals.
11. Temporary power as indicated on drawings or required. Refer to Section 01 5000 - Temporary Facilities and Controls
12. Any solenoid valves will be supplied and installed by Plumbing Contractor. Electrical power wiring supply and install by Electrical Contractor.
13. Electrical Contractor shall firestop electrical back boxes, where required, in fire rate partitions as per detail.
14. Coordinate roof top removals with the General Contractor to maintain the building watertight.
15. Refer to Food Service Equipment specification section 11-4000 for coordination of work items.

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

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 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Change procedures.

C. Procedures for preparation and submittal of application for payments.

1.3 RELATED REQUIREMENTS

A. Section 00 5200 - Form of Agreement: Contract Sum, retainages, payment period.

B. Section 00 6000 - Bonds and Certificates.

C. Section 00 7200 - General Conditions: Requirements for progress payments, final payment, changes in the Work.

D. Section 01 7800 - Closeout Submittals for additional requirements for Final Payment.

E. Section 01 2100 - Allowances: Payment procedures relating to allowances.

F. Section 01 7800 - Closeout Submittals: Closeout requirements, final payment and project record documents.

1.4 SCHEDULE OF VALUES

A. Form to be used: AIA G702/703.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Fuller and D'Angelo, P.C. for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values in PDF Format within 10 days after date Letter of Award.

E. Format: Utilize the Table of Contents of the Project Manual. Identify each line item with number and title of the specification Section. Identify bonds and sub-contractors.

F. Revise schedule to list approved Change Orders, with each Application For Payment.

G. Provide a separate line item for the following: (where applicable):

1. Bonds. (Bond premium may be paid when invoice of premium is provided).
2. OCP . (Policy premium may be paid when invoice of premium is provided).
3. Labor and materials, when payment is anticipated for material not installed.
4. Submittals: (0.25%). Minimum of contract amount.)
5. Each allowance.
6. Each alternate, if any.
7. Meeting attendance. (0.25% Minimum of contract amount.)
8. As-built Drawings : ((0.5%) Minimum of contract amount)
9. Testing, HVAC balancing reports. (0.5% Minimum of contract amount.)
10. Punch List (0.25% Minimum of contract amount)
11. Final Cleaning
12. Closeout Documents (0.25% Minimum of contract amount).
13. Authorized change orders.

H. Revise schedule to list approved Change Orders, with each Application For Payment.

I. Sub-schedules: Where the Work is separated into existing buildings provide separate payment applications, or provide sub-schedules showing values correlated with each existing building.

J. For public school projects identify each application with the SED Project number and Fuller and D'Angelo's project number for each building.

1.5 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use approved Schedule of Values.

C. Execute certification by signature of authorized officer.

D. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

E. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

F. Submit one (1) electronic "pencil copy", in PDF format, of each Application for Payment to Owner's Representative and Fuller and D'Angelo, P.C. for approval.

G. After Architect's approval of the "pencil copy" submit three hard copies of approved Application for Payment to Fuller and D'Angelo, P.C.

H. Include the following with each application:

1. Transmittal letter as specified for submittals in Section 01 3000.
2. Construction progress schedule, revised and current as specified in Section 01 3216.
3. Partial Waivers of Mechanic's Lien: With each Application for Payment, submit partial waivers of mechanic's liens from Contractor, subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
    a. Waiver Forms: Submit waivers of lien on forms, provided by the Architect in Section 01 2005.
4. When an application shows completion of an item, submit final or full waivers.
5. Submit Final Application 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.
6. Certified Payrolls: All Applications for Payment must be accompanied with certified payrolls for all Contract Work performed. **Each contractor and sub-contractor shall submit to the Owner within thirty days after issuance of its first payroll, and every thirty days thereafter**, a transcript of the original payroll record subscribed and affirmed as true under penalties of perjury. The Owner shall be required to receive and maintain such payroll records. The original payrolls or transcripts shall be preserved for three years from the completion of the work on the awarded project.
    a. Submit certification that all personnel listed on certified payrolls have successfully completed an OSHA construction safety and health course of at least 10 hours prior to performing any work on the project. Certification shall be within the last five (5) years.

I. Liens: No Payment will be made when a lien is filed against Owner by contractor or any subcontractor, or supplier or other entities until such lien is removed, bonded or similar action acceptable to the Owner

J. Project record documents as specified in Section 01 7800 - Closeout Submittals, shall be available for review by Owner's Representative as a prerequisite for approval of payments.

K. Payment for stored materials (whether on-site but not installed, or stored in secured warehouse) will require a bill of lading showing the exact value. In no case will more than 90% be approved if the item is not installed. Insurance certificates will be provided specific to materials stored (for on-site or offsite items).

L. When Owner's Representative and Fuller and D'Angelo, P.C. requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

M. The Owner shall retain Five (5) percent of the amount of each payment.

1.6 INITIAL APPLICATION FOR PAYMENT:

A. Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. Executed contract.
2. Approved bonds.
3. Approved insurance certificates.
4. Approved Schedule of Values.
5. Names of full time project manager, on site superintendent, and foreman.
   a. Include telephone and e-mail address.
6. List of suppliers and fabricators: .
7. List of subcontractors: .
8. Contractor's Construction Schedule (preliminary if not final).
9. Contractor's Submittal Schedule.

1.7 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

A. Comply with Requirements of Section 01 7800 - Closeout Submittals.

1.8 MODIFICATION PROCEDURES

A. Refer to General Conditions AIA 201 Article 7 for additional requirements

B. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ, subcontractors and other Prime Contractors whose work is affected by any modifications or changes to the Contract Documents

C. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Owner's Representative and Architect will issue instructions directly to the contractor.

D. For other required changes, Fuller and D'Angelo. will issue a document signed by Owner's Representative and Architect instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.

1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
2. Promptly execute the change.
3. Refer to the General Conditions AIA 201 Article 7.3 for additional information.

E. Owner's Representative and Architect may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change . The Contractor shall prepare and submit a fixed price quotation within five (5) days.

F. Contractor may propose a change by submitting a request for change to Owner's Representative and Fuller and D'Angelo, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors.

G. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

1. Refer to General Conditions AIA 201 Article 7.
2. For change requested by Owner's Representative and Architect for work falling under a fixed price contract, the amount will be based on Contractors 's price quotation.

3. For change requested by the Contractor, the amount will be based on the Contractor 's request for a Change Order as approved by Owner's Representative and Architect.
4. For pre-determined unit prices, unit costs, allowance and quantities, the amount will based on the fixed unit costs or allowance.
5. For change ordered by Owner's Representative and Architect without a quotation from, the amount will be determined by Owner's Representative based on the Contractor's substantiation of costs as specified for Time and Material work.

H. Substantiation of Costs: Provide full information required for evaluation.
1. On request, provide the following data:
a. Quantities of products, labor, and equipment.
b. Taxes, insurance, and bonds.
c. Overhead and profit.
d. Justification for any change in Contract Time.
e. Credit for deletions from Contract, similarly documented.
2. Support each claim for additional costs with additional information:
a. Origin and date of claim.
b. Dates and times work was performed, and by whom.
c. Time records and wage rates paid.
d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
a. If the contractor is directed to perform work on a “Time and Material” basis he will notify the Owner's Representative prior to starting and will present an itemized T&M sheet daily for Owner's Representative signature at the end of the shift. No payments will be made for any T&M work without daily signed worksheets.

I. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided the Contract.

J. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

K. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

L. Promptly enter changes in Project Record Documents.

1.9 APPLICATIONS FOR PAYMENT WHEN BEHIND SCHEDULE

A. When the project falls behind schedule the Contractor shall demonstrate the actions to be taken to put the project back on schedule.
1. Payments will not be approved until satisfactory evidence is presented to put the project on schedule.

1.10 APPLICATION FOR PAYMENT AFTER SCHEDULED COMPLETION DATE

A. In the event the work is not completed by the schedule date, listed in Section Section 01 1000 Summary of Contracts, and in addition to the other remedies described, the Architect will not review progress payment requisitions submitted after the construction completion date, and the District will not issue any progress payments after that date, until all work is completed.
1. Only one requisition for work performed, after the construction completion date, may be submitted, and it may be submitted only when all work is complete and a Punch List inspection is conducted; said requisition may be submitted when the work at 100% complete, less retainage.

1.11 APPLICATION FOR FINAL PAYMENT

A. Comply with Section 01 7800 - Closeout Submittals.

B. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

C. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7800 - Closeout Submittals are submitted and approved.
   2. All "punch list" items have been completed.
   3. All Releases of Liens.

D. It is understood by the Contractor that the maximum payment due the contractor prior to final payment shall be Ninety (95%) of the Contract amount and the final Five (5%) will be due only after the above is satisfied.

END OF SECTION

SECTION 01 2005
PARTIAL RELEASE OF LIEN

CONTRACTOR/SUBCONTRACTOR/VENDOR'S LETTERHEAD

Name of Facility: Greenville & Seely Place Elementary Schools

Address: 100 Glendale Road & 51 Seely Place

Name of Owner: Edgemont School District

Project: HVAC Upgrades And Cafeteria Renovations

Name of the Contractor/Subcontractor/Vendor: _____

Address: _____

Trade/Vendor:_____

Application # _____ Dated _____.

We certify that we have completed _____% of our Contract.

Prior to this requisition we have received payment equal to _____ % of of our contract amount.

The undersigned, upon receipt of the above requisition payment hereby releases and discharges the Owner of and from any liability or obligation in any way related to or arising out of this project up to and including the date of this document.

The undersigned further covenants and agrees that it shall not in any way claim or file a mechanic's or other lien against the premises of the above designated project, or any part thereof, or against any fund applicable thereto for any of the work, labor, materials heretofore furnished by it in connection with the improvement of said premises.

The undersigned further warrants that, in order to induce the Owner to release this partial payment, they have paid all claims for labor, material, .insurance, taxes, equipment, etc., employed in the prosecution of the work above, to date of this requisition.

The undersigned hereby releases and agrees to hold the Owner harmless from any and all claims in connection with the furnishing of such labor and materials, etc., for the construction of the aforementioned project.

The undersigned further guarantees that all portions of the work furnished .and/or provided by them are in accordance with the contract and that the terms of the contract with respect to these guarantees will hold for the period specified in said contract.

IN WITNESS WHEREOF, we have executed under seal this release on the above date and to be legally bound hereby:

WITNESS: _____FIRM: _____

BY: _____

_____

State of New York, County of _____ subscribed and sworn to before me this _____ day of _____ 202____

Notary public

My commission expires _____

END OF SECTION

SECTION 01 2100
ALLOWANCES

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 SECTION INCLUDES

A. This Section includes administrative and procedural requirements governing allowances.

B. Selected materials and equipment are specified in the Contract Documents by allowances. The allowances may include removals and/or installation.

C. Total allowances shall be included in the base bid proposal. The final contract sum will be adjusted by Change Order. The following allowances include:
   1. Cash allowances.
   2. Inspecting and testing allowances.
   3. Special Commissioning Allowance
   4. Payment and modification procedures relating to allowances.

1.3 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.4 PAYMENTS FOR ALLOWANCES

A. Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts.
   1. **Bond, Overhead and Profit will be included in Base Bid for all Allowances**.

B. Cash Allowance: Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, equipment rental, will be included in Change Orders authorizing expenditure of funds from the Cash Allowance and **shall be determined in accordance with Article 7 of the General Conditions.**
   1. Cost of product to Contractor or subcontractor, less applicable trade discounts , less applicable taxes.

C. The Contract Sum for all allowances shall be adjusted accordingly by Change Order.

D. Payment will not be made for any of the following: (If applicable)
   1. **Work performed prior to measurement and establishing quantities.**
   2. Products waste not used or disposed of off site.
   3. Products determined as unacceptable before or after placement.
   4. Products not completely unloaded from the transporting vehicle.
   5. Products performed or placed beyond the lines and levels of the required Work.
   6. Products remaining on hand after completion of the Work.
   7. Loading, hauling, and disposing of rejected Products.

E. At closeout of Contract, funds remaining in Cash Allowance will be credited to Owner by Change Order.

1.5 ALLOWANCE RESPONSIBILITY

A. Cash Allowances:
   1. Owner's Representative and Architect Responsibilities:
      a. Consult with Contractor, for consideration and selection of products, suppliers, and installers.
      b. Select products in consultation with Edgemont School District and transmit decision to Contractor.
      c. Prepare Change Order.
   2. Contractor Responsibilities: (To be included in the Contract Sum but not in the allowances.)

a. Assist Owner's Representative and Architect in selection of products, suppliers, and installers.
b. Obtain proposals from suppliers and installers and offer recommendations.
c. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
d. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
e. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

3. Differences in costs will be adjusted by Change Order.

1.6 COMMISSIONING ALLOWANCE

A. Costs Included in the Commissioning Allowances: Cost of an Commissioning Agent selected by the Owner to perform commissioning of the HVAC system as directed by the Owner.

1.7 ALLOWANCES SCHEDULE

A. **CONTRACT #1 - GENERAL CONSTRUCTION CONTRACTOR**

1. GREENVILLE ES
   a. Cash Allowance _____ : Include a Cash Allowance for use according to the Owner's instructions.
      Fifteen Thousand_____ ($15,000.00) DOLLARS
   b. Door Access Control Allowance:
      Three Thousand_____ ($3,000.00) DOLLARS
2. SEELY PLACE ES
   a. Cash Allowance _____ : Include a Cash Allowance for use according to the Owner's instructions.
      Fifteen Thousand_____ ($15,000.00) DOLLARS
   b. Door Access Control Allowance:
      Three Thousand _____ ($3,000.00) DOLLARS

TOTAL ALLOWANCES CONTRACT #1 GENERAL CONSTRUCTION
Thirty Six Thousand_____ ($36,000.00) DOLLARS
(Sum of 1.7.A.1a, and b and 1.7.A.2.a and b to be inserted on bid form).

B. **CONTRACT #2 - PLUMBING CONTRACTOR**

1. GREENVILLE ES
   a. Cash Allowance _____ : Include a Cash Allowance for use according to the Owner's instructions.
      Five Thousand_____ ($5,000.00) DOLLARS
2. SEELY PLACE ES
   a. Cash Allowance _____ : Include a Cash Allowance for use according to the Owner's instructions.
      Five Thousand_____ ($5,000.00) DOLLARS

TOTAL ALLOWANCES CONTRACT #2 PLUMBING
Ten Thousand_____ ($10,000.00) DOLLARS
(Sum of 1.7.B.1.a and 1.7.B.2.a to be inserted on bid form).

C. **CONTRACT #3 - HVAC CONTRACTOR**

1. GREENVILLE ES
   a. Cash Allowance _____ : Include a Cash Allowance for use according to the Owner's instructions.
      Ten Thousand_____ ($10,000.00) DOLLARS
   b. Automatic Temperature Control Allowance:
      Seventy Five Thousand _____($75,000.00) DOLLARS

2. SEELY PLACE ES
   a. Cash Allowance _____ : Include a Cash Allowance for use according to the Owner's instructions.
      Twenty Thousand_____ ($20,000.00) DOLLARS
   b. Commissioning Allowance _____:
      Twenty Thousand_____ ($20,000.00) DOLLARS
   c. Automatic Temperature Control Allowance:
      [Twenty Thousand]_____ ($20,000.00]) DOLLARS

TOTAL ALLOWANCES CONTRACT #3 HVAC

Eighty Thousand_____ ($80,000.00) DOLLARS

(Sum of 1.7.C.1.a, 1.7.C.2.a, and 1.7.C.2.b to be inserted on bid form).

D. **CONTRACT #4 - ELECTRICAL CONTRACTOR**

1. GREENVILLE ES
   a. Cash Allowance _____ : Include a Cash Allowance for use according to the Owner's instructions.
      Seven Thousand Five Hundred_____ ($7,500.00) DOLLARS
2. SEELY PLACE ES
   a. Cash Allowance _____ : Include a Cash Allowance for use according to the Owner's instructions.
      Seven Thousand Five Hundred_____ ($7,500.00) DOLLARS

TOTAL ALLOWANCES CONTRACT #4 ELECTRICAL

FifteenThousand_____ ($15,000.00) DOLLARS

(Sum of 1.7.D.1.a and 1.7.D.2.a to be inserted on bid form).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.3 RELATED REQUIREMENTS

A. Section 00 2113 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 01 2100 - Allowances, for cash allowances affecting this section.

C. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

D. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling and restrictions on timing of substitution requests.

E. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.4 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
2. Agrees to provide the same warranty for the substitution as for the specified product.
3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Edgemont School District.
5. Waives claims for additional costs or time extension that may subsequently become apparent.
6. Agrees to reimburse Architect for review or redesign services associated with re-approval by authorities.
7. Statement indicating why specified material or product cannot be provided.
8. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
9. Samples, where applicable or requested.
10. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
11. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
12. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
13. 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.

14. Cost information, including a proposal of change, if any, in the Contract Sum.
15. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
16. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         a) Official project name and number, and any additional required identifiers established in Contract Documents.
      b. Substitution Request Information:
         a) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         b) Indication of whether the substitution is for cause or convenience.
         c) Issue date.
         d) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         e) Description of Substitution.
         f) Reason why the specified item cannot be provided.
         g) Differences between proposed substitution and specified item.
         h) Description of how proposed substitution affects other parts of work.
      c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
         a) Physical characteristics.
         b) In-service performance.
         c) Expected durability.
         d) Visual effect.
         e) Sustainable design features.
         f) Warranties.
         g) Other salient features and requirements.
         h) Include, as appropriate or requested, the following types of documentation:
            (a) Product Data:
            (b) Samples: Provide full size actual sample of item proposed for substitution. Sample shall be provided, without exception, even if the originally specified item did not require a sample.
            (c) Certificates, test, reports or similar qualification data.
            (d) Drawings, when required to show impact on adjacent construction elements.
      d. Impact of Substitution:
         a) Savings to Edgemont School District for accepting substitution.
         b) Change to Contract Time due to accepting substitution.

D. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.
   2. Deliver sample to Architect.

3.2 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:
   1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

3.3 SUBSTITUTION PROCEDURES AFTER AWARD OF CONTRACT

A. Submittal Form:
   1. Submit substitution requests by completing the form attached to this section. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Architect will consider requests for substitutions only within 10 days after date of Agreement.

C. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.
   3. When acceptance will require revisions to Contract Documents.

3.4 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

3.5 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

3.7 ATTACHMENTS

A. A facsimile of the Substitution Request Form (During Construction) required to be used on the Project is included after this section.

SUBSTITUTION REQUEST FORM

Provide form typewritten Hand written forms will not be accepted.

SUBSTITUTION REQUEST No. _____

(After the Bidding Phase)

Project: HVAC Upgrades And Cafeteria Renovations

Substitution Request Number: _____

From: _____

Date: _____

A/E Project Number: 21434.01

Contract For: _____

Specification Title: _____Description: _____

Section:_____ Page:_____ Article/Paragraph: _____

Proposed Substitution:

Manufacturer: _____ Address: _____ Phone:_____

_____model no.: _____

Installer:_____ Address: _____ Phone: _____

History: _____New product _____2-5 years old _____ 5-10 yrs old _____ More than 10 years old

Differences between proposed substitution and specified product:

_____

Point-by-point comparative data attached - REQUIRED

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____

Address:_____ Owner: _____

Date Installed: _____

Proposed substitution affects other parts of Work: ____ No ____Yes; explain

_____

Savings to Owner for accepting substitution: _____ ($)

Proposed substitution changes Contract Time: ____ No ____ Yes Add _____Deduct _____days.

Supporting Data Attached: ____ Drawings ____ Product Data ____ Samples _____ Tests Reports

The Undersigned certifies:

Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.

Same warranty will be furnished for proposed substitution as for specified product.

Same maintenance service and source of replacement parts, as applicable, is available.

Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.

Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.

Proposed substitution does not affect dimensions and functional clearances.

Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments:

A/E's REVIEW AND ACTION

Refer to Specification Section 01 3000 - Administrative Requirements.

:_____Date:_____

Additional Comments: __ Contractor __ Subcontractor __ Supplier __ Manufacturer __ A/E

_____

_____

_____

_____

_____

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

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 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Contractor's daily reports.

E. Submittals for review and information.

F. Number of copies of submittals.

G. Requests for Interpretation (RFI) procedures.

H. Submittal procedures.

I. Submittal Cover Sheet.

1.3 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions.

B. Section 01 1000 - Summary of Contracts: Sequence of Work, Work covered by each contract occupancy .

C. Section 01 2000 - Price and Payment Procedures

D. Section 00 2115 - RFI Form.

E. Section 01 2500 - Substitution Procedures.

F. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

G. Section 01 3553 - Site Safety and Security Procedures

H. Section 01 7000 - Execution.

I. Section 01 7800 - Closeout Submittals.

J. Section 01 9113 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.

1. Where submittals are indicated for review by Architect, Consultant, and Commissioning Authority submit one extra and route to Construction Manager first, be for forwarding to the Owner's Representative and Commissioning Authority.

1.4 REFERENCE STANDARDS

A. See Section 01 4219 - Reference Standards.

1.5 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:

1. Requests for Interpretation (RFI).
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.

7. Applications for payment and change order requests.
8. Progress schedules.
9. Correction Punch List and Final Correction Punch List for Substantial Completion.
10. Closeout Submittals.

1.6 PROJECT COORDINATION

A. Owner's Representative: Ray Renda, 914-472-7767.
   1. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings. Prepare similar memoranda for the Architect and separate contractors where coordination of their work is required.

B. Each Contractor shall:
   1. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
      a. Preparation of schedules.
      b. Installation and removal of temporary facilities.
      c. Processing of submittals and photocopying/delivery to affected contractors.
      d. Progress meetings.
      e. Project closeout activities.
   2. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.
   3. Coordination: Each contractor shall coordinate its construction operations with those of other Contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.
      a. Coordinate installation of different components with other contractors and/or subcontractors to ensure maximum accessibility for required maintenance, service, and repair

C. Each shall cooperate with the Owner's Representative in allocation of mobilization areas of site, access, traffic, parking facilities, field offices, and sheds.
   1. During construction, coordinate use of site and facilities through the Owner's Representative.

D. Comply with Architect's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Owner's Representative for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 5000 - Temporary Facilities and Controls.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field

reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.

2. Each Contractor and Architect and Construction Manager are required to use this service.
3. It is Contractor's responsibility to submit documents in allowable format.
4. Subcontractors, suppliers, and Construction Manager and Architect's consultants will be permitted to use the service at no extra charge.
5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected service is:
   1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.

C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Construction Manager and Architect and Contractor participating; further training is the responsibility of the user of the service.

D. Project Closeout: Architect and Construction Manager will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Edgemont School District.

3.2 PRECONSTRUCTION MEETING

A. Owner's Representative and Architect will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Edgemont School District.
   2. Fuller and D'Angelo, P.C.
   3. Consultants.
   4. All contractors.
   5. Contractor's Field Superintendent.

C. Agenda:
   1. Execution of Edgemont School District-Contractor Agreement.
   2. Submission of executed Bonds and Insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of schedule of values, progress schedule, list of products,, and list of subcontractors/suppliers.
   5. Submission of DOL Award of Contract form (PW-39).
   6. Designation of personnel representing the parties to Contract.
   7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, change orders, and contract closeout procedures.
   8. Review construction scheduling.
   9. Use of premises by Owner and Prime Contractors.
   10. Edgemont School District's requirements and occupancy prior to completion.
   11. Temporary utilities provided by Edgemont School District.
   12. Survey existing facilities prior to staring construction.
   13. Security and housekeeping procedures.

D. Architect will record minutes and distribute copies within five days after meeting to all participants. Contactor shall distribute to all entities of the Contractor affected by decisions made.

3.3 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at minimum of two week intervals.

B. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
   1. Contractor(s).
   2. Edgemont School District.
   3. Fuller and D'Angelo, P.C.
   4. Consultants.
   5. Contractor's superintendent.
   6. Major Subcontractors.
   7. Suppliers as appropriate to agenda topics for each meeting.

D. Attendees: In addition to the Owner's Representative and Architect, each Prime Contractor shall be represented at these meetings.
   1. Attendance is mandatory at each meeting and a penalty sum of as indicated in 01 2000 - Price and Payment Procedures will be assessed to each Prime Contractor or the Contractor not attending without prior written authorization from the Owner's Representative Subcontractors, suppliers, or other entities will be invited at the discretion of the Owner's Representative. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the work
   2. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work

E. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of delivery schedules.
   7. Review construction safety programs.
   8. Review exiting and separation of construction
   9. Maintenance of progress schedule.
   10. Corrective measures to regain projected schedules.
   11. Planned progress during succeeding work period.
   12. Coordination of projected progress.
   13. Maintenance of quality and work standards.
   14. Effect of proposed changes on progress schedule and coordination.
   15. Other business relating to work.

F. Architect will record minutes and distribute copies within five days after meeting to all participants. Contactor shall distribute to all entities of the Contractor affected by decisions made.

3.4 WEEKLY COORDINATION MEETINGS

A. The Construction Manager shall schedule and hold weekly general project coordination meetings at regularly scheduled times that are convenient for the attendance of prime contractors and other parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Required attendance includes General Construction Contractor, Plumbing Contractor, HVAC Contractor, and Electrical Contractor and every other entity identified by any prime contractor as being currently involved the coordination or planning for the work of the entire project. Conduct meetings in a manner that resolve coordination problems. Contract #1

General Construction Contractor shall preside at each meeting, and shall record meeting results. Contract #1 General Construction Contractor shall distribute copies of the meeting result to everyone in attendance, the Architect and Construction Manager and to others affected by the decisions and actions resulting from each meeting.

1. Each Contractor review with the Owner's Representative the work schedule for the week in order to insure the planned work does not conflict with facility operations.

3.5 CONSTRUCTION PROGRESS SCHEDULE - See Section 01 3216

3.6 DAILY CONSTRUCTION REPORTS

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

B. Transmit reports electronically to Architect and Construction Manager at weekly intervals.

C. Each Contractor shall prepare a daily construction report recording the following information concerning events at Project site and project progress:

1. Date.
2. High and low temperatures, and general weather conditions.
3. List of subcontractors at Project site.
4. Major equipment at Project site.
5. Material deliveries.
6. Safety, environmental, or industrial relations incidents.
7. Meetings and significant decisions.
8. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
9. Testing and/or inspections performed.
10. Signature of Contractor's authorized representative.

3.7 PROOF OF ORDERS AND DELIVERY DATES

A. Within two (2) weeks after the approval of shop drawings, samples, product data and the like, the Contractor(s) shall provide copies of purchase orders for all equipment and materials which are not readily available in local stock or requested by Owner's Representative and Architect. The Contractor(s) shall submit written statements from suppliers confirming the orders and stating promised delivery dates. Dates shall be indicated and coordinated with the Construction Schedule.

1. Payments will not be approved unless documentation is provided.

3.8 COORDINATION AND COORDINATION DRAWINGS

A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.

B. All primes shall provide information required by other primes for preparation of coordination drawings required by a prime contractor.

1. All roofing work must be performed by roofing sub-contractors approved by the roofing manufacturer and insure roofing warranty is maintained.

C. Review drawings prior to submission to Architect .

1. Indicate all HVAC equipment, ductwork, and major piping, including elevations and dimensions to all fixed building elements, such as beams; columns; slabs; ceilings, including ceiling suspension; framing; floors; walls; doors, including door swings; and windows affected by the equipment, ductwork, and piping.
2. Indicate all existing and proposed lighting fixtures, smoke detectors, and sprinkler heads.

3. Show location of all valves, dampers (fire, smoke, volume, and automatic), coils, humidifiers, smoke detectors, etc. requiring access for service and maintenance.
4. Show all registers, grilles, diffusers, radiators and convectors, and other terminal elements.
5. Locate all access doors.
6. Include large-scale details and sections as required to fully delineate the conditions in congested areas, leaving space for the work of the other trades.
7. Show plan layout of all equipment and anchoage and fasteners

3.9 SPECIAL COORDINATION DRAWINGS

A. Procedures for special coordination drawings shall be in accordance with paragraphs below:

1. The Construction Contractor shall furnish sufficient experienced drafting and engineering personnel to prepare coordination drawings and participate in coordination meetings scheduled and directed by the Owner's Representative. The Construction Contractor Contractor shall submit the coordination drawings of their trades within 15days from the date of the Letter of Award. Each of the other Contractors shall prepare their coordination drawings within ten days of receiving the coordination drawing "Set" from the previous contractor.
2. Coordination drawings shall be completed and submitted for distribution in time so as not to delay the construction. The coordination drawings may lack complete data in certain instances pending receipt of shop drawings, but sufficient space shall be allotted for the items affected.
3. The Construction Contractor shall initiate coordinating the installations for all the Contractors by means of coordination and sleeve drawings, as specified herein.
    a. The Construction Contractor shall prepare CADD drawing on CD indicating their equipment and appurtenances for each floor and phase, at not less than 3/8" scale. The drawings shall show beams, columns, ceiling grid and heights, walls/partitions, casework, floor to floor dimensions, floors, windows, door swings etc. that relates to the construction.
    b. The Construction Contractor shall deliver CADD drawing on CD to HVAC Contractor, with copy of transmittal to Architect and Construction Manager .
4. The HVAC Contractor shall overlay on CADD drawing on CD, at a scale of 3/8" = 1'-0" showing all HVAC equipment, ductwork, and major piping, including elevations and dimensions to all fixed building elements, such as beams; columns; slabs; ceilings, including ceiling suspension; framing; floors; walls; doors, including door swings; and windows affected by the equipment, ductwork, and piping. Show all registers, grilles, diffusers, radiators and convectors, and other terminal elements Show location of all valves, dampers (fire, smoke, volume, and automatic), coils, humidifiers, smoke detectors, etc. requiring access for service and maintenance. Locate all access doors. Include large-scale details and sections as required to fully delineate the conditions in congested areas, leaving space for the work of the other contractors. Show plan layout of all equipment bases, pads, and inertia blocks. Clearly label all work by HVAC Contractor.
    a. HVAC Contractor shall deliver CADD drawings on CD to Plumbing Contractor, with copy of transmittal to Architect and Construction Manager. The Construction Contractor shall verify elevations and dimensions to all fixed building elements, such as beams; columns; slabs; ceilings, including ceiling suspension; framing; floors; walls; doors, including door swings; and windows
5. The Plumbing Contractor shall overlay on the mylar transparency coordination drawings prepared by the HVAC Contractor all water supply, drain, waste, vent, sprinkler main and branch piping, risers and sprinkler heads and other major lines. Indicate piping elevations and locations of fire hose cabinets, drinking fountains, etc. which encroach on duct shafts. Locate valves and other items requiring access for service and maintenance. Locate all access doors. Avoid interference with HVAC work and with building construction. Use same scale as drawing being overlaid. Clearly label all work by Plumbing Contractor.
    a. Plumbing Contractor shall deliver mylar transparencies to Electrical Contractor with copy of transmittal to Architect and Construction Manager.
6. The Electrical Contractor shall overlay on CADD drawings on CD coordination drawings prepared by Construction and HVAC Contractors all main conduit and bus runs, cable trays, light

fixtures, major equipment, and switch gear and panel boards. Show elevations and clearances. Show all items requiring access for service and maintenance. Locate all access doors. Avoid interference with HVAC work and with building construction. Use same scale as drawings being overlaid. Clearly label all work by Electrical Contractor

a. Electrical Contractor shall deliver CADD drawings on CD to Construction Contractor with copy of transmittal to Architect and Construction Manager.

7. The Construction Contractor shall review and verify all beams, columns, ceiling grid and heights, walls/partitions, casework, floor to floor dimensions, floors, windows, door swings etc. that relates to the construction.
8. Each Contractor shall attend coordination meetings and participate as directed by Architect or Construction Manager to resolve interference and conflicts. All such coordination work is included in the contract responsibility of each involved contractor. When mutually agreed, make minor changes in ductwork, piping, or conduit routing or equipment location required to avoid space conflicts, but do not resize items or relocate exposed items without the Architect's approval. Do not make changes in wall or chase locations, ceiling heights, door swings or locations, window or other openings, or other items affecting the function or aesthetic effect of the building. If conflicts or interference cannot be satisfactorily resolved with such minor changes, notify the Owner's Representative who shall obtain a decision from the Architect.
9. Each Contractor shall prepare coordination drawings without awaiting final product approval of terminal devices, outlets, fixtures, etc. Provide sufficient space for such items and re-coordinate as required when final product approval is obtained.
10. No preference or advantage shall be given to any contractor in considering solution of conflicts, or grant priority to any one contractor in the allocation of space. If the contractors are unable to reach an agreement on a matter on a matter of interference the matter shall be submitted to the Architect for his binding decision. Should any problems of coordination require architectural or structural changes of design, this change shall be submitted to the Architect for approval.
11. After the set of mylar has been coordinated and all necessary changes have been made, these drawings shall then by signed off by each of the contractors, indicating their awareness of and agreement with the indicated routings and layouts and their inter-relationship with the adjoining or contiguous work of all contracts Thereafter, no unauthorized deviations will be permitted and if made without the knowledge or agreement of the Architect and Owner's Representative or other affected contractors, will be subject to removal and correction at no additional cost to the Owner.
12. After final coordination and sleeve drawings have been agreed upon and signed by all contractors. The Construction Contractor shall provide and distribute copy in PDF format to each of the Prime Contractors, the Architect and Construction Manager for reference and record purposes. Contractors desiring additional copies of such drawings, beyond the basic distribution indicated above shall arrange and pay for cost of same.

B. Each contractor as a working reference shall retain the record copies of final coordination drawings. All shop drawings, prior to their submittal to the Architect shall be compared with the coordination drawings and developed accordingly by the contractor responsible. Any revisions to the coordination drawings, which may become necessary during the progress of the work shall be noted by all Contractors and shall be neatly and accurately recorded on the record copies. Each Contractor shall be responsible for the up-to-date maintenance of their own record copies of the coordination drawings and keep one copy available at the site. Each Contractor and sub Contractors in the development of their “as-built” drawings thereto, shall utilize the coordination drawings and any subsequent changes. The Contractor(s) may not use coordination drawings for the submittal of ductwork.

C. NO EXTRA COMPENSATION will be paid to any contractor for relocating any duct, pipe, conduit, or other material installed without coordination among trades involved or among other affected contractors. Each Contractor who causes any additional work to other contractors by improperly coordinated work or work not installed in accordance with the signed coordination drawings shall reimburse the affected other contractors for the cost of the additional work.

D. All changes in the work on any contract, whether a change in price is given or not, shall be shown on the coordination drawings.

E. Coordination drawings shall not be used for “shop drawings” or "as-built" drawings except where approved by the Owner's Representative.

F. Upon completion of the project, the Construction Contractor shall turn over the original reproducible coordination drawings, plus 4 blue-line copies to the Owner's Representative.

3.10 REQUESTS FOR INTERPRETATION (RFI)

A. Use RFI Section 00 2115 - RFI Form.

3.11 SUBMITTAL SCHEDULE

A. Submit to Owner's Representative and Architect for review in tabular format the following:
   1. Shop Drawing and Submittal Log no later than ten (10) days after Letter of Award.
   2. Submit at the same time as the preliminary schedule.
   3. Coordinate with Contractor's Master construction schedule and schedule of values.
   4. Format schedule to allow tracking of status of submittals throughout duration of construction.
   5. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
      a. Identify long lead and critical items critical to maintain the construction schedule.
   6. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.
   7. No payments will be processed when a submittal is not submitted as scheduled or the project fall behind schedule until the Contractor submits a revised schedule approved by the Architect.

3.12 SUBMITTALS FOR REVIEW

A. Submittal Cover Sheet: Attached at the end of this section.

B. All submittals are the product and the property of the Contractor. The Owner, Owner's Representative , Architect, or Consultants shall not be responsible for the Contractor's construction means, methods or techniques: safety precautions or programs; Acts or omission or failure to carry out the work in accordance with the contract documents.

C. Coordinate transmittal of related items so processing will not be delayed due to requirement of coordination.
   1. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
   2. Unauthorized submittals will be considered non-responsive and returned or discarded by the Architect without action.

D. Submittal Cover Sheet and Stamp Sheet, attached to this section, shall be used for **each** submittal.

E. All critical and long lead shop drawing submittals shall be submitted no later than ten (10) days after Letter of Award of Contract. No further payments will be made to the contractor after ten (10) days until all critical and long lead are submitted.
   1. If the submittal is rejected for being incomplete, the time period for review does not start until the complete submittal is turned in to the Owner's Representative, Architect, or Consultants.

F. When the following are specified in individual sections, including but not limited to the following, submit them for review:
   1. Product data.
   2. Shop drawings.

3. Samples for selection.
4. Templates.
5. Contractor's engineering calculations.
6. Design mix formulas.
7. Standard wiring diagrams.
8. Warranties.
9. Additional items identified in individual sections.

G. Submit to Owner's Representative and Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the reviewing documents.
   1. Submittals for HVAC, Plumbing, Electrical, or Structural submit directly to consultant with copy to Architect.

H. Samples will be reviewed only for aesthetics, color, or finish selection and for record documents purposes described in Section 01 7800 - Closeout Submittals.

I. After review, provide copies and distribute in accordance with Submittal Procedures article below .

J. The Architect and Consultant shall review and approve or take other appropriate action on the Contractor submittals, such as shop drawings, product data, samples and other data, which the Contractor is required to submit, but **only for the limited purpose of reviewing for conformance with the design concept and the information given in the Construction Documents**. This review shall not include review of the accuracy or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods, coordination of the work with other trades or construction safety precautions, all of which are the sole responsibility of the Contractor. The Architect and Consultant's review shall be conducted with reasonable promptness while allowing sufficient time in the Architect's judgment to permit adequate review. Review of a specific item shall not indicate that the Owner's Representative, Architect, Consultant, and Construction Manager has reviewed the entire assembly of which the item is a component. **The Architect and Consultant shall not be responsible for any deviations from the Construction Documents not brought to the attention of the Architect and Consultant, in writing, by the Contractor.** The Architect and Consultant shall not be required to review partial submissions or those for which submissions of correlated items have not been received by Architect and Consultant.

K. Markings or comments on the shop drawing shall not be construed as relieving the Contractor from compliance with the contract project plans and specifications nor departure therefrom. The Contractor remains responsible for details of accuracy for conforming and correlating all quantities, verifying all dimensions for selecting fabrication processes, for techniques of assembly and for performing his work satisfactorily and in a safe manner.

L. **Architect will review the original submittal and one (1) re submittal. Additional reviews due to the Contractor's failure to meet contract requirements will be additional services provided to the Owner and charged accordingly. All additional costs incurred by the Owner will back charge to the Contractor accordingly.**

M. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing and acquisition of materials to meet approved construction schedule.

N. Deviations: Highlight, encircle, or otherwise identify all deviations from the Contract Documents on submittals.

3.13 SUBMITTALS FOR PROJECT CLOSEOUT

A. Refer to Section 01 7800 - Closeout Submittals..

3.14 NUMBER OF COPIES OF SUBMITTALS AND FORMAT

A. Documents: Submit one electronic copy in PDF format; an electronically-marked up document will be returned. Create PDFs at native size and right-side up; illegible document will be rejected. Submittals shall conform to the following:

1. Each item shall be in a separate PDF format.
2. Each document name shall start with the specification section number and contain an abbreviated explanation of what it contains; for example:
   a. 08 5113 Aluminum Window Shop Drawings; 08 8000 Glazing.
3. Add Revision number (Rev2 Rev3, etc) to the file name when resubmitting items, for example:
   a. 07 5323 EPDM Revl.pdf Bond AdhRevl.pdf
4. Make all technical submittals at one time per trade- refer to the specification for additional submittal requirements for example:
   a. Concrete; Masonry; Miscellaneous Fabrications; Roofing; etc.
5. Do not send MSDS with the technical submittals; collate all of the MSDS needed for the entire project in three ring binders, organized by specification section, and submit the binders to the Owner's Representative, with copy of Transmittal to the Architect, and maintain one copy at the project site.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Owner's Representative.
   1. **Submit with each sample, in electronic PDF format, data, cuts, photos, color, charts, etc**.
   2. Approved sample will be retained at the project site.
   3. Retained samples will not be returned to Contractor unless specifically so stated.

3.15 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   2. Transmit using Submittal Coversheet attached to this section.
   3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   5. Apply Contractor's stamp on the attached form, certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
      b. **All submitted shop drawings shall be stamped and signed by the Contractor with the following note:**
         a) **We the undersigned certify that we have reviewed and coordinated this shop drawings with job conditions and Contract requirements and they are in conformance to the plans, specifications and other provisions of the Contract Documents.**
   6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Send submittals in electronic format via email to Owner's Representative, Architect, and Consultant.
   7. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 10 working days excluding delivery time to and from the Contractor.
      b. For sequential reviews involving Architect and Consultant or another affected party, allow an additional 7 days.
   8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   9. When revised for resubmission, identify all changes made since previous submission.

10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
11. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
12. **Submittals** not requested will be recognized and will be returned "Not Reviewed".

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.16 SUBMITTAL REVIEW

A. Submittals for Review: Owner's Representative, Architect, and Consultant will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect and Consultant will acknowledge receipt and review. See below for actions to be taken.

C. Contractor's Delegated Design:
1. Architect’s review and approval of delegated design submittals is limited to performance and design criteria and review of general design concepts in accordance with the General Conditions and Specifications.

D. Substitution:
1. The Contractor shall carry out the Work in accordance with the Contract Plans and Specifications without change in Contract Sum or Contract Time.
   a. Proceeding with the Work, the Contractor acknowledges that they are responsible for:
      a) coordinating this substitution with subcontractor(s) or other Prime Contractor(s)
      b) and any additional costs from subcontractor(s) or other Prime Contractor(s) resulting from this substitution.

E. Architect and Consultant's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Architect's and their consultants' actions on items submitted for review:
   a. **Authorizing purchasing, fabrication, delivery, and installation:**
      a) "No Exceptions Taken", or language with same legal meaning.
      b) "Make Corrections Noted", or language with same legal meaning.
   b. **Sample:**
      a) Samples will be reviewed only for aesthetic, color, or finish.
   c. **Not Authorizing fabrication, delivery, and installation:**
      a) "Revise and Resubmit"
         (a) Resubmit revised item, with review notations acknowledged and incorporated.
      b) "Rejected".

(a) Submit item complying with requirements of Contract Documents.

d. **Architect's and their Consultants' actions on items submitted for information:**

SUBMITTAL COVERSHEET

Edgemont School District

HVAC Upgrades And Cafeteria Renovations

Greenville & Seely Place Elementary Schools

ARCHITECT:	**OWNER:**
Fuller and D'Angelo, P.C.	**Edgemont School District**
45 Knollwood Rd.	**300 White Oak Lane .**
Elmsford, NY10523	**Scarsdale, NY 10583**

CONTRACTOR: _____ CONTRACT: _____

ADDRESS: _____

DATE _____TELEPHONE: _____EMAIL: _____

Facility Name: Greenville & Seely Place Elementary Schools

Type of Submittal: Re-submittal: [ ] No [ ] Yes [ ] Certificate [ ] Warranty [ ] Color Sample

[ ] Shop Drawings [ ] Product Data [ ] Schedule [ ] Sample [ ] Test Report [ ] Certificate

SUBMITTAL DESCRIPTION: _____

PRODUCT NAME: _____

MANUFACTURER: _____

SUBCONTRACTOR/_____

SUPPLIER: _____

SPEC.#_____ DWG. #s _____ PAR.#: _____ RM. OR DETAIL #s: _____

STAMP SHEET

Contractor Remarks And Stamp:

We the undersigned certify that we have reviewed and coordinated this shop drawings with job conditions and Contract requirements and they are in conformance to the plans, specifications and other provisions of the Contract Documents.

_____
_____
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Architect's Comments and Stamp:

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Consultant's Comments and Stamp

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_____

NAME: _____ **DATE:** _____

END OF SECTION

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

C. Master Schedule.

1.3 RELATED SECTIONS

A. Section 01 1000 - Summary of Contracts: Work sequence and occupancy.

B. Section 01 3000 - Administrative Requirements.

1.4 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

1.5 RESPONSIBILITY

A. Each Contractor shall develop a full schedule, in sufficient detail and clarity of form and technique so that the General Construction Contractor can plan and control his work properly and the Owner's Representative can readily monitor and follow the progress for all portions of the work.
   1. Each Contractor shall complete the detailed schedule within [10] days after Letter of Award.
   2. Identify all long lead items and dates required on site.
   3. In the event of conflict Owner's Representative shall resolve and provide direction which is in the best interest on the District.
   4. Each Contractor shall coordinate their work with work of all prime contractors.

B. Contract #1 General Construction Contractor shall prepare a draft master schedule within 5 days after receiving schedules from each prime contractor and distribute to all prime contactors, Owner's Representative and Architect.
   1. Within 5 days after receiving draft master schedule all prime contractors shall meet to revise, (if required) and sign off on the master schedule.
      a. In the event of conflicts the Owner's Representative shall resolve and provide direction which is in the best interest on the District.
   2. Contract #1 General Construction Contractor shall be responsible for incorporating all final revision, schedules, of all prime contractors, and prepare a **full final master schedule,** and updates, as required or directed by the Owner's Representative.

C. Contract #1General Construction Contractor shall coordinate their work with work of all prime contracts.

D. The activities identified in the schedule shall be analyzed in detail to determine activity time durations in units of whole working days. All duration's shall be the result of definitive manpower and resource planning by each Contractor.

E. 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. Contractor or subcontractor responsible for the work.
   2. Specifications as listed in the Project Manual.
   3. System: Division of the work into building systems for summary purposes.
   4. Milestone: Work associated with completion of interim completion dates or milestones

1.6 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule.

B. If preliminary schedule requires revision after review, submit revised schedule within 5 days.

C. Within 5 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that all prime Contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule every 14 days .

F. Submit updated master schedule with each Application for Payment.

G. Submit in PDF format.

H. Submit under transmittal letter form specified in Section 01 3000 - Administrative Requirements.

I. All Contractors are hereby notified that payment requisitions will not be processed by the Owner's Representative and Architect, nor paid by the Owner, until all schedules are reviewed, updated and approved by Owner's Representative and Architect and Master Schedule revised.

1.7 QUALITY ASSURANCE

A. Scheduler: Contractor 's personnel or specialist Consultant specializing in construction scheduling with three (3) years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: 3 years minimum experience in using and monitoring Bar Chart schedules on comparable projects.

1.8 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each building and each activity. Identify each activity with the applicable specification section number.

B. Submit schedule in electronic PDF format.

C. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

B. Based on the preliminary development of the progress schedule and on feedback from Owner's Representative, Architect, and other prime contractors or whatever updating may have occurred during the project start-up, Contract #1 General Construction Contractor shall, for the entire work of of all the prime contracts, , prepare the (Master Schedule), secure critical time commitments for performing major elements of all the work.

3.2 GENERAL CONTENT.

A. Milestones: Include milestones in schedule, including, but not limited to, Notice of Award, Submittals, Verification of existing conditions, Asbestos/Lead Abatement, Removals, Delivery of Major Equiment, such as HVAC Units, Fans, Motors, Installation, Substantial Completion, Completion of Punch List, Final Completion, and Closeout

B. Show complete sequence of construction by phase, activity, by room with dates for beginning and completion of each element of construction.

C. Identify each item by specification section number.

D. Identify work of Addition and other logically grouped activities.

E. Provide sub-schedules for each stage of Work identified in Section 01 1000 - Summary of Contracts.

F. Include conferences and meetings in schedule.

G. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from Architect and Construction Manager. Indicate decision dates for selection of finishes.

I. Provide legend for symbols and abbreviations used.

3.3 BAR CHARTS

A. Include a separate bar schedule for multiple buildings and Master Schedule each major portion of Work or operation.

B. Identify the first work day of each week.

3.4 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Construction Manager at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, the Master Schedule and resubmit within 5 days.
   1. When project work is behind schedule indicate revisions required to put the project on schedule.
   2. Payments will not be approved until satisfactory evidence is presented, by the Contractor(s) behind schedule, to put the project on schedule.

3.5 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.6 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Owner's Representative, Architect, other Prime Contractors, subcontractors, and major suppliers and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

3.7 CHANGES, DELAYS AND EXTENSIONS OF TIME

A. When changes or delays are experienced, each Contractor shall submit to the Owner's Representative and Architect a Time Impact Analysis illustrating the influence of each change or delay on the current Contract scheduled completion date. Each time analysis shall include a Fragment (network analysis) demonstrating how the Contractor proposed to incorporate the change or delay into the Detailed Schedule.
   1. Each time analysis shall include a Fragment (network analysis) demonstrating how the Contractor proposed to incorporate the change or delay into the Detailed Schedule.
   2. 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 effected activities.
   3. The activity duration used in this analysis shall be those included in the latest update of the Detailed Schedule, closest to the time of delay or as adjusted by mutual agreement.

B. Each Time Impact Analysis shall be submitted within five (5) 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 Time Impact Analysis 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 Time Impact Analysis by the Owner's Representative and Architect shall be made within fourteen (14) calendar days after receipt 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, fragments illustrating the influence of changes and delays shall be incorporated into the Detailed Master Schedule by the Contract #1 General Construction during the first update after agreement is reached.

END OF SECTION

SECTION 01 3306
NON-DISCRIMINATION CLAUSES

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 REQUIREMENTS

A. During the performance of this contract, the contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color or national origin, and will take affirmative action to insure that they are afforded equal employment opportunities without discrimination because of race, creed, color or national origin. Such action shall be taken with reference, but not be limited, to: recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training or retraining, including apprenticeship and on-the job training.
2. The contractor will send to each labor union or representative of workers with which he has or is bound by a collective bargaining or other agreement or understanding, a notice, to be provided by the State Commission for Human Rights, advising such labor union or representative of the contractor's agreement under these clauses hereinafter called "non-discrimination clauses" and requesting such labor union or representative to agree in writing, standing or otherwise, that such labor union or representative will not discriminate against any member or applicant for membership because of race, creed, color or natural origin. Such action shall be taken with reference, but not limited, to: recruitment, employment job assignment, promotion, upgrading, demotion, transfer, layoff, or termination, rates of pay or other forms of compensation, and selection for training or retraining, including apprenticeship and on-the-job training. Such notice shall be given by the Contractor, and such written agreement shall be made by such labor union or representative, prior to the commencement of performance of this contract. If such labor union or representative fails or refuses so to agree in writing the Contractor shall promptly notify the State Commission of Human Rights of such failure or refusal.
3. The Contractor will post and keep posted in conspicuous places, available to employees and applicants for employment, notices to be provided by the State Commission for Human Rights setting forth the substance of the provisions of clauses and such provisions of the State's laws against discrimination as the State Commission for Human Rights shall determine.
4. The Contractor will state, in all solicitation or advertisements for employees placed by or on behalf of the contractor, that all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color or national origin.
5. The Contractor will comply with the provisions of Section 291-299 of the Executive Law and the Civil Rights Law, will furnish all information and reports deemed necessary by the State Commission for Human Rights under these non-discrimination clauses and such sections of the Executive Law, and will permit access to his books, records and accounts by the State Commission for Human Rights, the Attorney General and the Industrial Commissioner for purposes of investigation to ascertain compliance with these non-discrimination clauses and such sections of the Executive Law and Civil Rights Law.
6. This contract may be forthwith canceled, terminated or suspended, in whole or in part by the Owner upon the basis of a finding made by the State Commission for Human Rights that the contractor has not complied with these nondiscrimination clauses, and the Contractor may be declared ineligible for future contracts made by or on behalf of the Owner or agency of the Owner, until he or it satisfies the State Commission for Human Rights that he or it has established and is carrying out a program in conformity with the provisions of these non-discrimination clauses. Such findings shall be made by the State Commission for Human Rights after conciliation efforts by the Commission have failed to achieve compliance with these nondiscrimination clauses and after a verified complaint has been filed with the Commission, notice thereof has been given to the

Contractor and an opportunity has been afforded him to be heard publicly before three members of the Commission. Such sanctions may be imposed and remedies invoked independently of or in addition to sanctions or remedies otherwise provided by law.

7. If this Contract is canceled or terminated under the above clause, in addition to other rights of the Owner, provided in this contract upon its breach by the Contractor, the Contractor will hold the Owner harmless against any additional expenses or costs incurred by the Owner in completing the work or in purchasing the services, materials, equipment or supplies contemplated by this contract, and the Owner may withhold payments from the contractors in an amount sufficient for this purpose and recourse may be had against the surety on the performance bond if necessary.
8. The Contractor will include the provisions of these clauses in every sub-contract or purchase order in such a manner that such provisions will be binding upon each sub-contractor or vendor as to operations to be performed within the State of New York. The Contractor will take such action in enforcing such provisions of such Sub-Contract or purchase order as the contracting agency may direct, including sanctions or remedies for non-compliance. If the contractor becomes involved in or is threatened with litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor shall promptly so notify the Attorney General, requesting him to intervene and protect the interests of the Owner.

END OF SECTION

SECTION 01 3307
SED SPECIAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies special requirements of State Education Department, including Commissioner's Regulation Part 155.5, 155.7
   1. Copies of Commissioner's Regulation Part 155.5, 155.7 are available on the State Education Department's web site.www.p12nysed.gov.
   2. Copy of Commissioner's Regulation Part 155.5 is included as Appendix to the specification.

1.3 CERTIFICATE OF OCCUPANCY

A. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a Certificate of Occupancy.

1.4 GENERAL SAFETY AND SECURITY DURING CONSTRUCTION

A. All construction materials shall be stored in a safe and secure manner.
   1. Fences around construction supplies or debris shall be maintained.
   2. Gates shall always be locked unless a worker is in attendance, to prevent unauthorized entry.
   3. 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.
   4. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites.

1.5 SEPARATION OF CONSTRUCTION

A. Separation of construction areas from occupied spaces. Construction areas that 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. Metal stud and gypsum board (Type X) 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 work hours, when approved by the Owner. Workers may not use corridors, stairs or elevators designated for students or school staff.
      a. 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.
      b. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each work day. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

1.6 FIRE PREVENTION

A. There is no smoking on school property for fire prevention and New York State Law.

B. Any holes in floors or walls shall be sealed with a fire resistant material.

C. Each shall maintain existing fire extinguishers.

D. Fire alarm and smoke detection systems shall remain in operation at all times.

1.7 CONSTRUCTION DIRECTIVES

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

1. Construction Fume Control: Each Contractor shall be responsible for the control of chemical fumes, gases, and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes.
2. Off-Gassing Control. Each 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 manufacturer's recommendations before a space can be occupied.

1.8 ASBESTOS

A. Asbestos/Lead Test Asbestos Letter. Indication that all school areas to be disturbed during renovation or demolition have been or will be tested for lead and asbestos.

B. Asbestos Code Rule 56. Large and small asbestos abatement projects as defined by 8 NYCRR 155.5(k) shall not be performed while the building is occupied. Note: It is SED's interpretation that the term "building" as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non combustible construction. The isolated portions (the occupied portion and the portion under construction) of the building must contain separate code compliant exits. The ventilation systems must be physically separated and sealed at the isolation barrier(s).

1. Asbestos TEM. The asbestos abatement area shall be completely sealed off from the rest of the building and completely cleaned and tested by TEM prior to re-entry by the public.
2. Lead Abatement Projects. A project that contains materials identified to be disturbed which tests positive for lead shall include that information in the Construction Documents. The Construction Documents must address the availability of lead testing data for the building and include a statement that the OSHA regulations be followed and that cleanup and testing be done by HUD protocol.

1.9 VENTILATION

A. The work, as scheduled in the existing building, is to be performed when the facility is unoccupied. In the event that work is required to be performed during times when the building is occupied, all existing ventilation system between areas of work and areas of occupancy shall be disconnected, separated and code complying ventilation requirements be provided the occupied area. Prior to such work commencing the contractor shall submit a plan, for review indicating procedure to be taken. Also see paragraph 1.5 above for additional requirements."

1.10 ELECTRICAL CERTIFICATION:

A. The Electrical Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for electrical installation.

1.11 EXITING

A. Exiting: Work will be performed when school is not in session or after school hours. All exiting will be clear and usable at all times.

B. All exits shall be clear and usable at all times.

C. All modifications or changes to the exiting plan shall be approved by the Architect.

1.12 CONSTRUCTION WORKERS IN OCCUPIED AREAS

A. No worker shall be permitted in areas occupied by students. If access is required by the contractor's personnel they will be supervised by District personnel. Contractor shall provided 24 hour notice to the Owner when such access will be required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 3553
SITE SAFETY AND SECURITY PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. The safety requirements, which must be followed by each Contractor during the execution of this contract.

B. Each Contractor agrees that the work will be completed with the greatest degree of safety and:

1. To conform to the requirements of the Occupational Safety and Health Act (OSHA) and the Construction Safety Act including all standards and regulations that have been or shall be promulgated by the governmental authorities which administer such acts, and shall hold the Owner, Owner's Representative, and Architect, and all their employees, consultants and representatives Owner, Owner's Representative, and Architect harmless from and against and shall indemnify each and everyone of them for any and all claims, actions, liabilities, costs and expenses, including attorneys fees, which any of them may incur as a result of non-compliance.

C. Security measures including entry control, personnel identification, and miscellaneous restrictions.

1.3 REFERENCES:

A. Code of Federal Regulations OSHA Safety and Health.

B. Education Department Regulations of the Commissioner Section 155.5 Uniform Safety Standards for School Construction and Maintenance Projects. (See Appendix).

1.4 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: Use of premises and occupancy.

B. Section 01 3307 - SED SPECIAL REQUIREMENTS.

C. Section 01 5000 - Temporary Facilities and Controls: Temporary lighting, site fence, and barriers and enclosures.

1.5 DEFINITIONS

A. Public shall mean anyone not involved with or employed by the contractor to perform the duties of this contract.

B. Site shall mean the limits of the work area.

C. Contractor shall mean the contractor, his/her subcontractors and any other person related to the contract execution.

1.6 SECURITY PROGRAM

A. Security and Protection Facilities and Services shall be the responsibility of each Contractor and all costs shall be included in their bid.

B. Protect Work including existing premises and Edgemont School District's operations from theft, vandalism, and unauthorized entry.

C. Coordinate with Edgemont School District's security program.

D. Initiate program in coordination with Edgemont School District's existing security system at project mobilization.

E. Maintain program throughout construction period until directed by Fuller and D'Angelo, P.C. .

1.7 ENTRY CONTROL

A. The existing building contains a security alarm system maintained and operated by the Owner. Access into the existing building shall not be permitted unless the Owner's Represetative is notified and arrangements made to deactivate the system

B. The Contractor shall restrict entrance of persons and vehicles into Project site and existing facilities.

C. Allow entrance only to authorized persons with proper identification.

D. Edgemont School District will control entrance of persons and vehicles related to Edgemont School District's operations.

E. Coordinate access of Edgemont School District's personnel to site in coordination with Owner's Represetative and Edgemont School District and security forces.

F. Traffic Control
   1. Each Contractor shall maintain access for emergency vehicles, fireman and pedestrians and protect from damage all persons and property within the limits of and for the duration of the contract; all in accordance with the plans and specifications.
   2. Conduct construction operations so that the traveling public and pedestrian safety is subjected to a minimum of hazard and delay.
   3. Each Contractor shall perform the following minimum requirements as directed by Owner's Represetative.
      a. Keep the surface of the traveled way free from mounds, depressions, and obstructions of any type which could present hazards or annoyance to traffic.
      b. Keep the surface of all pavements used by the public free and clean of all dirt and debris or other obstructions to provide safe traveled ways.
      c. Control dust and keep the traveled way free from materials spilled from hauling and construction equipment.
   4. Ingress and Egress
      a. Contractor shall provide and maintain at all times safe and adequate ingress and egress to and from site at existing or at new access points consistent with work, unless otherwise authorized by the Owner's Representative
   5. All traffic control costs shall include the base bid of furnishing all labor, material and equipment including the cost of any and all incidental required by job conditions as ordered by Owner's Represetative

1.8 FIRE PREVENTION AND CONTROL

A. Each Contractor shall provide Fire Extinguishers as follows: Provide type "A" fire extinguishers for temporary offices and similar spaces where there is minimal danger of electrical fires or grease-oil-flammable liquid fires. In other locations provide either type "ABC" dry chemical extinguishers, or a combination of several extinguishers of NFPA recommended types for the exposures in each case.
   1. All required exits, fire alarm, security, automatic temperature control, PA, sprinkler and similar systems shall be maintained and operable throughout the entire construction contract.
      a. Contractor(s) will be back-charged for all fines imposed for false alarms or service calls.

B. Free access to fire hydrants and standpipe connections shall be maintained at all times during construction operations. Portable fire extinguishers shall be provided by the Construction Contractor and made conveniently available throughout the construction site. Contractor(s) shall notify their employees of the location of the nearest fire alarm box at all locations where work is in progress.

C. Each Contractor shall take all possible precautions for the prevention of fires. Where flame cutting torches, blow torches, or welding tools are required to be used within the building, their use shall be as approved by the Construction Manager at the site. 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.

D. Fuel for cutting and heating torches shall be gas only and shall be contained in Underwriters laboratory approved containers.

E. Storage of gas shall be in locations as approved by the Owner and subject to Fire Department regulations and requirements.

F. 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.

1.9 PERSONNEL IDENTIFICATION

A. Provide identification badge or other approved identification to each contractor, their subcontractor's project superintendent, employees, directly or indirectly employed by the contractor or persons authorized to enter premises.

B. Maintain a list of accredited persons, submit copy to Owner's Represetative on request.

C. Fingerprinting: The Contractor acknowledges and agrees that he/she or its employees may be subject to fingerprinting and a criminal history record check as may be required by the Educational Law of the State of State of New York. In such an event, Contractor agrees to cooperate with Owner's Represetative and to complete any and all forms or procedures, all at no cost or expense to the Edgemont School District.

1.10 RESTRICTIONS

A. Refer to Section 01 1000 - Summary of Contracts for COVID and vaccine restrictions.

B. Do not allow cameras on site or photographs taken except by written approval of Owner's Represetative.

PART 2 PRODUCTS -

PART 3 EXECUTION

3.1 GENERAL

A. In the performance of its contract, each Contractor shall exercise every precaution to prevent injury to workers and the public or damage to property.

1. Each Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work to be done under this contract. Each Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss including but not limited to:
    a. All employees working in connection with this contract, and other persons who may be affected thereby.
    b. All the work materials and equipment to be incorporated therein whether in storage on or off site; and including trees, shrubs, lawns, walks, pavements, facilities not designated for removal, relocation or replacement in the course of construction.

B. Each Contractor's duties and responsibilities for the safety and protection of the work: shall continue until such time as all the work is completed and contractor has removed all workers, material and equipment from the site, or the issuance of the certificate of final completion, whichever shall occur last.

C. Each Contractor shall use only machinery and equipment adapted to operate with the least possible noise, and shall so conduct his operations that annoyance to occupants of the site and nearby homes and facilities shall be reduced to a minimum

D. It shall be the responsibility of each Contractor to insure that all employees of the contractor and all subcontractors, and any other persons associated with the performance of their contract shall comply with the provisions of this specification.

E. Each Contractor shall follow all rules and regulations put forth in the Code of Federal Regulations (OSHA Safety and Health Standards).

END OF SECTION

SECTION 01 3554
PREVAILING WAGE RATES

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General , Supplementary, and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 PROVISIONS OF LAW DEEMED INSERTED

A. Each and every provision of law and clauses required by law to be inserted in the Contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the Contract shall forthwith be physically amended to make such insertion.

B. The Contractor and subcontractors shall comply with applicable provisions of the Labor Law and all other state laws and Federal and Local statues ordinances, codes, rules and regulations and orders which are applicable to the performance of this contract. The Contractor shall likewise require all sub-contractors to comply therewith. The attention of the Contractor is particularly, but not exclusively, directed to Sections 220 through 223 of the New York State Labor Law and Sections 109 of the New York State Municipal Corporations Law and the following:

1. The Contractor shall post the prevailing wages in a conspicuous place on the job site.
2. Posters shall list the Department of Labor's Public work field offices with telephone numbers.

C. All contractors and subcontractors shall furnish each of its workers with written notification of the applicable prevailing wage rates and supplements at the commencement of and at periodic intervals during the performance of the Work as required by the New York Labor Law

D. The Contractor shall provide and keep certified payroll records at the job site.

E. Prevailing Wages Schedule for this project can be obtained by the bidders on the DOL web site as follows:

1. http://www.labor.ny.gov/workerprotection/publicwork/PWContents.shtm.
2. Click on: "Request for Wage and Supplement Information" (PW39).
3. View "Previously Requested Prevailing Wage Schedule" using PRC# 2022000185

F. NOTE THESE WAGE RATES ARE EFFECTIVE UNTIL JUNE 30, of each year. Updated schedules will be available on the Department of Labor web site: www.labor.state.ny.us

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Quality assurance.

B. Testing and inspection agencies and services.

C. Contractor's construction-related professional design services.

D. Contractor's design-related professional design services.

E. Control of installation.

F. Mock-ups.

G. Tolerances.

H. Manufacturers' field services.

I. Defect Assessment.

1.3 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions.

B. Section 01 2100 - Allowances: Allowance for payment of testing services.

C. Section 01 3000 - Administrative Requirements: Submittal procedures.

D. Section 01 4216 - Definitions.

E. Section 01 4219 - Reference Standards.

F. Section 01 6000 - Product Requirements.

1.4 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2015a, with Editorial Revision (2016).

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.

G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2017.

1.5 DEFINITIONS

A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.

1.6 CONTRACTOR'S TEMPORARY CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's temporary professional design services are subject to requirements of project's General Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
   1. Temporary foundation underpinning.
   2. Investigation of soil conditions to support construction equipment or structure.

1.7 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections and drawings.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
   1. Structural Design of Steel Connections: As described in Section 05 1200 - Structural Steel.
   2. Structural Design of Metal Framing: As described in Section 05 4000 - Cold-Formed Metal Framing.
   3. Structural Design of Metal Fabrications: As described in Section 05 5000 - Metal Fabrications.
   4. Structural Design of Stairs: As described in Section 05 5100 - Metal Stairs.
   5. Structural Design of Railings: As described in Section 05 5213 - Pipe and Tube Railings.

1.8 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements.

B. Designer's Qualification Statement: Submit for Fuller and D'Angelo, P.C. 's knowledge as contract administrator, or for Edgemont School District's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
      a. Full name.Owner
      b. Professional licensure information.
      c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

D. Test Reports: After each test/inspection, promptly submit one (1) copy of report to Owner's Representative and Architect.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect and Construction Manager, provide interpretation of results.

2. Test report submittals are for Owner's Representative and Architect 's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor to Owner's Representative, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Owner's Representative.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, for the Owner's Representative and Architect 's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Owner's Representative and Architect's benefit as contract administrator.
1. Submit report in PDF format within 30 days of observation to Owner's Representative, Architect, and Contractor for information.
2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of work, each Prime Contractor shall submit agency name, address, and telephone number, and names of full time responsible officer and Special Inspector.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in New York.

1.10 REFERENCES AND STANDARDS - See Section 01 4219

1.11 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Edgemont School District will employ and pay for services of an independent testing agency to perform all specified in the individual technical sections and other which is the responsibility of the Owner.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:
1. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
2. Laboratory: Authorized to operate in New York.
3. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 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 manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect and Construction Manager before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

3.2 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality for Owner's Representative and Architect will use to judge the Work.

C. Notify Owner's Representative and Architect five (5) working days in advance of dates and times when mock-ups will be constructed.

D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

E. Obtain Owner's Representative and Architect's approval of mock-ups before starting work, fabrication, or construction.

1. Make corrections as necessary until Architect's approval is issued.

3.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Owner's Representative and Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.4 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of the Contractor.
4. Agency has no authority to stop the Work.

C. Re-testing required because of non-conformance to specified requirements shall be shall be performed by the same agency on instructions by Owner's Representative paid for by Contractor.

3.5 OWNER'S TESTING AND INSPECTIONS

A. All Code Required Special Testing and Procedures; Refer to Section 01 4533.

B. Coordinate with Architect and Construction Manager.

C. Owner will engage a qualified testing agency or special inspector to conduct tests and inspections are the responsibility of Owner and paid for by Owner as follows:

1. Asbestos inspection and air monitoring
2. Soil bearing capacity and bottom of footings.
3. Compaction and backfilling.
4. Wall footings and pier footing reinforcing, size and placement.
5. Foundation wall reinforcing and placement.
6. Placement of concealed flashing.
7. Structural steel column, beam and miscellaneous framing members.
8. Field bolts & welded connections.
9. Shop fabrication and welding.

D. Contractor shall perform the work in an efficient manner consistent with industry standards. Excessive testing resulting from the contractor's inability to perform efficiently will result in back charges to the contractor.

E. All re-inspections required for work not properly installed shall be paid for by the contractor.

F. The Owner will not be liable for any costs or delay claims due to the testing agency or special inspector failure to provide inspection without proper and sufficient notification.

G. All requests by the contractor for inspection that are cancelled and result in charges to the Owner will be back charged to the contractor.

3.6 CODE REQUIRED SPECTIAL INSPECTIONS AND PROCEDURES

A. Refer to Section 01 4533 - Code-Required Special Inspections and Procedures and various drawings.

3.7 CONTRACTOR'S TESTING AND INSPECTION

A. Testing and Inspections shall be conducted by a qualified testing agency or special inspector, approved by the Owner's Representative as required by authorities having jurisdiction and as indicated in individual Specification Sections as the contractor's responsibility including but not limited to:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Owner's Representative promptly of irregularities and deficiencies observed in the work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Special Inspector, Architect, and Contractor with copy to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. All design mixes.
6. Testing and balancing of all mechanical and plumbing.
7. Testing Fire Alarm, smoke detection systems, and emergency light
8. Electrical Certification: The Electrical Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for electrical installation.
9. Testing as required by individual specification sections.

3.8 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, adjusting as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Construction Manager 30 days in advance of required observations.

1. Observer subject to approval of Architect and Construction Manager.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions in writing to Special Inspector, Construction Manager, and Architect.

3.9 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Construction Manager, it is not practical to remove and replace the Work, Owner's Representative and Construction Manager will direct an appropriate remedy or adjust payment.

C. The attached Non-Conformance Log shall be maintained by Construction Manager with copies to Architect

3.10 REQUIRED REPORT CERTIFICATIONS

A. The following form shall be maintained by Construction Manager.

NON CONFORMANCE LOG

Project: _____

Project No.: _____

Non-Conformance Item # (See Note 1)	Special Report No. Reference /Date	Summary of Non-Conformance	Date Response Received within 24 hrs.	Re-inspection Required	Date Contractor Verification Received (See Note 1)	Status (See Note 2)
NC-1						
NC-2						
NC-3						
NC-4						
NC-5						
NC-6						
NC-7						

1. New items are in bold. For each non-conformance item above, the general contractor or subcontractor must sign and submit the contractor verification statement located in the RDP response report.
2. Non-conformance items remain" open" until the contractor verification have been received. When the signed verifications have been received by the RDP, the item will be " closed" distributed with 7 days

TESTING/INSPECTION AGENCY'S REPORT OF SPECIAL INSPECTIONS

Project Name: Greenville & Seely Place Elementary Schools HVAC Upgrades and Cafeteria Renovations

Special Inspector:_____
Special Inspector Project No.: _____
RDP: _____

Owner: Edgemont School District

Owner Address: 300 White Oak Lane,
Scarsdale, NY 10583

Architect of Record: Fuller and D'Angelo, P.C. Fuller & D'Angelo Project No.: 21434.01

To the best of my information, knowledge, and belief, the Special Inspections and testing required for this project and designated for this Agent in the Statement of Special Inspections (which includes Specification Section 014533 and the Schedule of Special Inspections) have been performed and discovered discrepancies have been reported and resolved except for the following:

Comments:

(Attach continuation sheets if required to complete description of uncorrected discrepancies.)

Respectfully submitted,

_____

Agent of the Special Inspector Title

_____

(Type or print name)

City, State ZIp_____

Design Professional Seal or Certification

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

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 GENERAL

A. Electrical Certification: The Plumbing Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for certification of electrical installations.

B. The Owner shall file and obtain the Building Permit.

C. The Contractor shall furnish and pay for all other permits, fees and other installation costs required for the various installations by governing authorities and utility companies; prepare and file drawings and diagrams required; arrange for inspections of any and all parts of the work required by the authorities and furnish all certificates necessary to the Owner's Representative and Architect as evidence that the work installed under this Section of the Specifications conforms with all applicable requirements of the State Codes, National Board of Fire Underwriters, and National Electric Code.

D. Any items of work specified herein and shown on the drawings which conflict with aforementioned rules, regulations and requirements, shall be referred to the Architect for decision, which decision shall be final and binding.

E. The work shall not be deemed to have reached a Substantial Completion until the certificates have been delivered.

1.3 SUMMARY OF REFERENCE STANDARDS

A. Regulatory requirements applicable to this project are the following:

1. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
2. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
3. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.
4. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
5. NFPA 1 - Fire Code; 2018.
6. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
7. New York State Uniform Fire and Building Codes known as the “Building Codes of the State of New York” and consist of the following:
    a. State Education Department Planning Standards, including Commissioner's Regulation Part 155.5, 155.7
    b. Energy Conservation Construction Code of New York State
    c. Fire Code of New York State
    d. Fuel Gas Code of New York State
    e. Mechanical Code of New York State
    f. Plumbing Code of New York State
    g. Utility Company Regulations and Requirements.
    h. Classification of Construction: Type IIB.
    i. Occupancy Classification:Education E
    j. State Education Department: Planning Standards is applicable to the work. Any conflicts between the Building Codes of New York and the State Education Department Planning Standards, the most restrictive shall apply. Copies of the Planning standards are available at the SED web site. http://www.p12.nysed.gov/facplan/
8. EPA - Environmental Protection Agency

9. IEEE - Institute of Electrical And Electronic Engineers
10. NEMA - National Electrical Manufacturers Association
11. UL - Underwriters Laboratories
12. OSHA Part 1926 Safety and Health Regulations for Construction.
13. Federal Regulation for Asbestos Abatement
    a. Title 30 CFR Part 61, Subpart G; The Transport and Disposal of Asbestos Waste
    b. The Transport and Disposal of Asbestos Waste]
    c. Title 40 CFR, Part 763 Asbestos Containing Materials in Schools; Final Rule and Notice
    d. Title 49 CFR Parts 106, 107, and 171-179.The Transportation Safety Act of 1974 and the Hazardous Material Transportation Act..
    e. Public Law 101-637 ASHARA
14. New York State Official Compilation of Codes, Rules and Regulations
    a. Title 12 Part 56
    b. Title 10 Part 73
    c. Title 6 Parts 360-364
    d. Labor Law - Article 30 and Sections 900-912
    e. All applicable Additions, Addenda, Variances and Regulatory Interpretation Memoranda

1.4 MANDATORY OSHA CONSTRUCTION SAFETY AND HEALTH TRAINING

A. All contractors and their subcontractor's project superintendent, employees, directly or indirectly employed by the contractor to work on the project must at all times, whenever on the Owner's property, wear an ID badge, safety vest, hard hat, etc. and all other required personal protective equipment as required by OSHA

1.5 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements.

B. Section 01 4219 - Reference Standards

C. Section 02 2080 - Asbestos Abatement.

D. Division 31 - Earthwork.

E. Division 32 - Exterior Improvements

F. Division 22 - Plumbing.

G. Division 23 - Heating, Ventilation and Air Conditioning.

H. Division 26 - Electrical.

1.6 QUALITY ASSURANCE

A. Regulations: Each Contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
    1. Building code requirements.
    2. Health and safety regulations.
    3. Police, fire department and rescue squad rules.
    4. Environmental protection regulations

B. Standards: Each Contractor shall comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

C. Designer Qualifications: Where delegated engineering design is to be performed under the construction contract provide the direct supervision of a Professional Engineer experienced in design of this type of work and licensed in NY .

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4216
DEFINITIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.3 DEFINITIONS

A. Owner: The term “Owner shall mean Edgemont School District and their duly authorized representative.
   1. The word “Owner” and the words “School Board”, “City School District”, “Board of Education”, “Union Free School District”, and “Central School District” etc., shall have the same meaning.

B. Architect: The term "Architect" or “Engineer” or the words “Architect/Engineer” shall mean the Professional Architect responsible for the contract documents Fuller and D'Angelo, P.C. 45 Knollwood Road, Elmsford, New York 10523.

C. Owner's Representative: The term "Owner's Representative", "Construction Manager" and other designer of the Owner shall have the same meaning.

D. The Director of Facilities shall mean Ray Renda, 914-472-7767.

E. Construction Manager: The term Construction Manager shall mean Triton Construction, 100 Quentin Roosevelt Blvd Suite 200 Garden City, NY 11530 United States of America, 516-780-8100, Kevin Sawyer, k-sawyer@tritonconstruction.com

F. MEP Consultant shall mean Landmark Facilities Group, Inc, 252 East Avenue, Norwalk, CT 06855

G. Food Service Consultant shall mean Raymond and Raymond. 44 St. John Street, Goshen, New York 10924

H. Environmental Consultant shall mean Eisenbach & Ruhnke, 291 Genesee Street Utica, NY 13501

I. Contractor for Construction: The term "Contractor", “Contractor for Construction”, “General Contractor”, “Contractor for General Work”, and "Construction Contractor” shall have the same meaning.

J. Contractor for Plumbing: The term “Plumbing Contract”, “Plumbing Contractor” “Contractor for Plumbing” shall have the same meaning.

K. Contractor for Mechanical: The term “HVAC Contract”, “HVAC Contractor”, "HV", “Contractor for HVAC”, "Mechanical Contractor" "Ventilation Contractor" etc. shall have the same meaning.

L. Contractor for Electrical: The term “Electrical Contract”, Electrical Contractor” “Contractor for Electric” shall have the same meaning.

M. Contractor(s): Shall include all separate contractor(s) having contracts with the Owner for the same project and may include but not limited to: General Construction, Plumbing, HV, HVAC, Electrical, Site and others

N. Prime Contractors: Shall include all separate contractors have contracts with the Owner for the same project and may include but not limited to: General Construction, Plumbing, HVAC, Mechanical, and Electrical and others.

O. "Approved": The term "approved," when used in conjunction with Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract and Section 01 3000 - Administrative Requirements.

P. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Owner's Representative and Architect, requested by Owner's Representative and Architect, and similar phrases.

Q. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.

R. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

S. "Installer": An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.

T. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

U. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

V. "Project site" is the space available for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings and may or may not be identical with the description of the land on which Project is to be built.

W. The term “Building Code” shall mean the Building Code of the State of New York including all amendments and reference standards to date.

X. "Work" - Labor, materials, equipment, apparatus, controls, accessories, and all other items customarily furnished and/or required for proper and complete disconnection and reconnection, installation of new work.

Y. "Wiring" - Conduit, fittings, wire, junction and outlet boxes, switches, cutouts, and receptacles and all items necessary or required in connection with or relating to such wiring.

Z. "Concealed" - Embedded in masonry or other construction, installed behind wall furring, within double partitions, or hung ceilings, in trenches, or in crawl spaces.

AA. "Exposed" - Not installed underground or "Concealed" as defined above.

AB. Furnish: The term "furnish" means to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations..

AC. Install: The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

AD. 'Noted' - as indicated on the drawings and/or specifications.

AE. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

AF. Provide: To furnish and install complete and ready for the intended use.

AG. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4533
CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Code-required special inspections.

B. Testing services incidental to special inspections.

C. Submittals.

D. Manufacturers' field services.

E. Fabricators' field services.

1.3 OWNER RESPONSIBILITY

A. All Code required testing will be performed and paid for by the Owner.

B. Owner will provide Special Inspector with complete set of executed Contract Bid Documents sealed by the Registered Design Professional.

1.4 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements

B. Section 01 4219 - Reference Standards.

C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.5 ABBREVIATIONS AND ACRONYMS

A. AHJ: Authority having jurisdiction.

B. IAS: International Accreditation Service, Inc.

C. NIST: National Institute of Standards and Technology.

1.6 GENERAL REQUIREMENTS

A. Special Inspections and Structural Testing shall be in accordance with Chapter 17 of the Building Code of New York State (BCNYS).

B. Construction Manager will schedule a Special Inspections preconstruction meeting at least 7 days prior to initial planned date for start of construction.

1. Discussions shall include the following:
    a. Review of specifications and Schedule of Special Inspections for work requiring Special Inspections.
    b. Responsibilities of the Prime Contractors, Owner, Testing Agency, Special Inspector, and Registered Design Professional.
    c. Notification and reporting procedures.
2. Attendees shall include Owner’s Representative, Contractor, Testing Agency, Special Inspector(s), and Geo-Tech Engineer.

1.7 DEFINITIONS

A. Code or Building Code: ICC (IBC), International Building Code, Most Recent Edition Adopted by New York State, Including All Applicable Amendments and Supplements and specifically, Chapter 17 - Special Inspections and Tests.

1. Including New York State Department of Education (SED).

B. Registered Design Professional(RDP): Licensed Professional Engineer or Registered Architect whose seal appears in the Construction Drawings. Unless noted otherwise, references to the Registered Design Professional (RDP) in this section refer to Architect or Consultants for building design.

C. The term Owner's Representative shall mean Construction Manager or other designee of the Owner.

D. The term Director of Facilities shall mean Ray Renda, 914-472-7767.

E. Special Inspection:
   1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the State Building Code that also require special expertise to ensure compliance with the approved contract documents and the referenced standards.
   2. Special inspections are separate from and independent of tests and inspections conducted by Contractor and Special Inspector for the purposes of quality assurance and contract administration.

F. Special Inspector: A Professional Engineer registered in the State of New York that has a minimum of four years of design experience with buildings and qualified to perform inspections assigned including structural, HVAC, plumbing, and electrical.

G. Testing/Inspecting Agency: Agent retained by Owner and coordinated by Construction Manager to perform some inspection services on behalf of Owner.

H. Testing/Inspecting Agency (Agent 1): Professional Engineer licensed in the State of New York that is qualified to perform structural inspections. The Special Inspector shall have a minimum of three years of experience performing inspections for similar projects.

I. Testing/Inspecting Agency (Agent 2): Professional Geotechnical Engineer licensed in the state of New York that is qualified to perform inspections for preparation of building subgrades and foundations.

J. Testing/Inspecting Agency (Agents 3 or 4): Agency or firm qualified to inspect certain structural elements and perform field and laboratory tests to determine the characteristics and quality of building materials and workmanship.

K. Statement of Special Inspections: Documents prepared by the Registered Design Professional and filed with and approved by the Architect and Construction Manager, listing materials and work requiring Special Inspections. These documents include this specification and the Schedule of Special Inspections.

L. Schedule of Special Inspections: An itemized list of inspections, verifications, and tests (including frequency) required for the project and individuals, agencies, or firms who will be retained to perform these services. The Schedule of Special Inspections is located in this section

M. Seismic/Wind-Force-Resisting System: Components of the structural system that provide resistance to seismic/wind forces. These components are identified in the Schedule of Special Inspections.

N. Continuous Special Inspection: Testing Agency and Special Inspector to perform full-time observation of work while the work is being performed.

O. Periodic Special Inspections: Part-time or intermittent observation of work by the or Testing Agency for work that has been or is being performed and at completion of work.

1.8 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).

B. AISC 341 - Seismic Provisions for Structural Steel Buildings; 2016.

C. AISC 360 - Specification for Structural Steel Buildings; 2016.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision (2018).

E. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2018b.

F. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2014a.

G. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.

H. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.

I. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).

J. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2017.

K. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops; 2018.

L. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010a (Reapproved 2015).

M. ASTM E2570/E2570M - Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage; 2007, with Editorial Revision (2014).

N. AWCI 117 - Technical Manual 12-B; Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials; an Annotated Guide; 2014.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

P. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

Q. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.

R. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2017.

S. IAS AC291 - Accreditation Criteria for Special Inspection Agencies; 2017.

T. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.9 QUALIFICATIONS

A. Special Inspections shall be performed by agents who have relevant experience for each category of inspections indicated in the drawings.

1.10 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Testing Agency Qualifications: Prior to the start of work, the Testing Agency is required to:
   1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   3. Submit certification that Testing Agency is acceptable to AHJ.
   4. Submit documentation that Testing Agency is accredited by IAS according to IAS AC89.

C. Manufacturer's Qualification Statement: Manufacturer shall submit documentation of manufacturing capability and quality control procedures.

D. Fabricator's Qualification Statement: Fabricator shall submit documentation of fabrication facilities and methods as well as quality control procedures.

E. Special Inspection Reports: After each special inspection, Special Inspector shall promptly submit one electronic copy of report, in PDF format, to Owner’s Representative, Contractor, and Registered Design Professionals for Structural Engineering and for Architecture..
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of Special Inspector.

d. Date and time of special inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of special inspection.
h. Date of special inspection.
i. Results of special inspection.
j. Compliance with Contract Documents.

2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

F. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector shall promptly submit one electronic copy of report, in PDF format to Owner's Representative, Architect, Construction Manager, and Contractor .

1. Include:
   a. Date issued.
   b. Name of Special Inspector.
   c. Date and time of special inspection.
   d. Identification of fabricated item and specification section.
   e. Location in the Project.
   f. Results of special inspection.
   g. Verification of fabrication and quality control procedures.
   h. Compliance with Contract Documents.
   i. Compliance with referenced standard(s).

G. Test Reports: After each test or inspection, promptly submit one electronic copy, in PDF format, to Owner's Representative, Architect, Construction Manager, Contractor, and Special Inspector.

1. Include:
   a. Date issued.
   b. Project title and number.
   c. Name of inspector.
   d. Date and time of sampling or inspection.
   e. Identification of product and specifications section.
   f. Location in the Project.
   g. Type of test or inspection.
   h. Date of test or inspection.
   i. Results of test or inspection.
   j. Compliance with Contract Documents.
2. Compliance with referenced standard(s).

H. Certificates: When specified in individual special inspection requirements, Special Inspector shall submit certification by the manufacturer, fabricator, and installation subcontractor to Owner, Architect, Construction Manager, and Contractor, in quantities specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Owner's Representative, Construction Manager, and Special Inspector .

I. Manufacturer's Field Reports: Submit reports to:

1. Submit report in, electronic copy, in PDF format, within 15 days of observation to Owner's Representative, Architect, Construction Manager, Contractor, and Special Inspector for information.

2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in Contract Documents.

J. Fabricator's Field Reports: Submit reports to Owner's Representative, Architect, Construction Manager, and Contractor
   1. Submit report, in PDF format, within 15 days of observation to Owner's Representative, Architect, Construction Manager, and Contractor for information.
   2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in Contract Documents.

1.11 SPECIAL INSPECTION AGENCY

A. Owner will employ and pay for services of a Special Inspection Agency to perform inspections and associated testing in accordance with ASTM E329 and required by the building code.

B. The Special Inspection Agency may employ and pay for services of an independent testing agency to perform testing associated with special inspections and required by the building code.

C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.12 TESTING AND INSPECTION AGENCIES

A. Owner will employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code or specification.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.13 QUALITY ASSURANCE

A. Special Inspection Agency Qualifications:
   1. Independent firm specializing in performing testing and inspections of the type specified in this section.
   2. Accredited by IAS according to IAS AC291.

B. Testing Agency Qualifications:
   1. Independent firm specializing in performing testing and inspections of the type specified in this section.
   2. Accredited by IAS according to IAS AC89.

PART 2 PRODUCTS

2.1 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
   1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

2.2 SPECIAL INSPECTIONS FOR FIRE RESISTANT PENETRATIONS AND JOINTS

A. Verify penetration firestops in accordance with ASTM E2174.

B. Verify fire resistant joints in accordance with ASTM E2393.

2.3 OTHER SPECIAL INSPECTIONS

A. Provide for special inspection of work that, in the opinion of the Owner, Architect, and Construction Manager, is unusual in nature.

B. For the purposes of this section, work unusual in nature includes, but is not limited to:
   1. Construction materials and systems that are alternatives to materials and systems prescribed by the building code.

2. Unusual design applications of materials described in the building code.
3. Materials and systems required to be installed in accordance with the manufacturer's instructions when said instructions prescribe requirements not included in the building code or in standards referenced by the building code.

PART 3 EXECUTION

3.1 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

A. Special Inspection Agency shall:
1. Provide qualified personnel at site. Cooperate with Owner's Representative and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified reference standards.
3. Ascertain compliance of materials and products with requirements of Contract Documents.
4. Promptly notify Owner's Representative, Architect, and Contractor of observed irregularities or non-conformance of work or products.Owner
5. Perform additional tests and inspections required by Owner's Representative, Architect, and Contractor.
6. Attend preconstruction meetings and progress meetings.
7. Submit reports of all tests or inspections specified. Reports shall include:
   a. Project Name.
   b. Owner Name.
   c. Inspector Name.
   d. Special Inspector.
   e. Statement stating the testing, inspection in conformance with these requirements and any discrepancies have been identified and corrected.
   f. Comments or other information.

B. Limits on Special Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the work.

C. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Owner's Representative and Architect.

D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.2 TESTING AGENCY DUTIES AND RESPONSIBILITIES

A. Testing Agency Duties:
1. Provide qualified personnel at site. Cooperate with Owner's Representative, Architect, and Special Inspector in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Owner's Representative, Contractor, and Special Inspector of observed irregularities or non-conformance of work or products.
5. Perform additional tests and inspections required by Testing Agency, Special Inspector, and AHJ.
6. Attend preconstruction meetings and progress meetings.
7. Submit reports of all tests or inspections specified within maximum of one (1) week.

B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.

3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the work.

C. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Owner's Representative and Architect.

D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

3.3 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. Contractor Responsibilities, General:
1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
2. Cooperate with Special Inspector agency and laboratory personnel; provide access to the work, to manufacturers' facilities, and to fabricators' facilities.
3. Provide incidental labor and facilities:
a. To provide access to work to be tested or inspected.
b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
c. To facilitate tests or inspections.
d. To provide storage and curing of test samples.
4. Notify Owner's Representative and laboratory three (3) days prior to expected time for operations requiring testing or inspection services.
5. Arrange with Owner's Representative and Special Inspector pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. As the work proceeds, perform remedial work, as directed and sign non-conformance reports stating remedial work has been completed to the Special Inspector.
7. Retain special inspection records.

B. Seismic Force-Resisting Systems: Submit written statement of responsibility for each item listed, to Owner's Representative prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

3.4 MANUFACTURERS' AND FABRICATORS' FIELD SERVICES

A. When specified in individual specification sections, require material suppliers, assembly fabricators, or product manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, to test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Owner's Representative and Architect 30 days in advance of required observations.
1. Observer subject to approval of Owner's Representative and Architect .

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.5 COMMUNICATION

A. Testing/Inspecting Agency shall immediately notify Contractor, Special Inspector, and Registered Design Professional by telephone, fax, or e-mail of test results failing to comply with requirements of Contract Documents.

B. Special Inspector shall immediately notify Contractor of work found to be in non-conformance with Contract Documents during inspections. If nonconforming work is not corrected while Special Inspector is on-site, Special Inspector shall notify Registered Design Professional within 24 hours (one business day) and issue an inspection report noting the non-conformance.

C. Special Inspector and each Testing/Inspecting Agent shall use a log to record and track non-conforming work during construction. Non-Conformance log shall include the following information:
1. Description of non-conformance.
2. Date of non-conformance.

3. Description of RDP response if received.
4. Status of non-conformance: ‘Open’ or ‘Closed.’

D. Updated log shall be attached to each inspection report. Special Inspector or Testing/Inspecting Agent may use Non-Conformance Log form provided at end of this section or other similar form.

E. If non-conforming work is not corrected at time of substantial completion of structure or other appropriate time, Special Inspector shall notify Architect, Construction Manager, and Contractor.

3.6 FINAL REPORT OF SPECIAL INSPECTIONS

A. At completion of work, each Testing/Inspecting Agency shall submit Agent’s Final Report of Special Inspections to Special Inspector stating work was completed in substantial conformance with Contract Documents and appropriate inspections and tests were performed. Testing/Inspecting Agency may use Agent’s Final Report of Special Inspections form provided at end of this section or other similar form.

B. At completion of work, Special Inspector shall compile a Final Report of Special Inspections including each Agent’s Final Report of Special Inspections. The Final Report of Special Inspections shall state required inspections have been performed and itemize nonconforming work not corrected or resolved as required by the NYSUC. Interim reports from all Agents will not be included unless specifically requested by the Owner or Code Enforcement Official. The Final Report shall be stamped by a New York State Professional Engineer.

C. Special Inspector may use Final Report of Special Inspections form provided at end of this section or other similar form based on .

D. Special Inspector shall submit Final Report of Special Inspections to Registered Design Professional and Code Enforcement Official prior to issuance of a Certificate of Use and Occupancy.

Final Report of Special Inspections

Project Name: Greenville & Seely Place Elementary Schools HVAC Upgrades and Cafeteria Renovations

Special Inspector: _____
Special Inspector Project No.: _____
RDP:_____

Owner: Edgemont School District:

Owner Address: 300 White Oak Lane,
Scarsdale, NY 10583

Architect of Record: Fuller and D'Angelo, P.C. Fuller & D'Angelo Project No.: 21434.01

To the best of my information, knowledge, and belief, Special Inspections required for this project, as indicated in the Statement of Special Inspections, (which includes Specification Section 014533 and the Schedule of Special Inspections) have been performed and discovered discrepancies have been reported and resolved except for the following:

Comments:

(Attach continuation sheets if required to complete description of uncorrected discrepancies.)

Interim reports submitted prior to this Final Report form a basis for and are to be considered an integral part of this Final Report. Upon request, the interim Testing and Special Inspection reports can be provided. Agent's Final Reports of Special Inspections are attached and are also a part of this Final Report.

Submitted By,

_____
Signature Special Inspector Title
___Page_____
Print Name

Professional Seal

Testing/Inspection Agent's Final Report of Special Inspections

Project Name: Greenville & Seely Place Elementary Schools HVAC Upgrades and Cafeteria Renovations

Special Inspector:_____
Special Inspector Project No.: _____
RDP: _____

Owner: Edgemont School District

Owner Address: 300 White Oak Lane,
Scarsdale, NY 10583

Architect of Record: Fuller and D'Angelo, P.C. Fuller & D'Angelo Project No.: 21434.01

To the best of my information, knowledge, and belief, the Special Inspections and testing required for this project and designated for this Agent in the Statement of Special Inspections (which includes Specification Section 014533 and the Schedule of Special Inspections) have been performed and discovered discrepancies have been reported and resolved except for the following:

Comments:

(Attach continuation sheets if required to complete description of uncorrected discrepancies.)

Respectfully submitted,

_____

Agent of the Special Inspector Title

_____

(Type or print name)

City, State ZIp_____

Design Professional Seal or Certification

APPROVED AGENCY NON CONFORMANCE LOG

Project: _____

Project N0.: _____

Non-Conformance Item # (See Note 1)	Special Report No. Reference /Date	Summary of Non-Conformance	Date SEOR Response Received within 24 hr	Reinspection Required	Date Contractor Verification Received (See Note 1)	Status (See Note 2)
NC-1						
NC-2						
NC-3						
NC-4						
NC-5						
NC-6						
NC-7						

1. New items are in bold. For each non-conformance item above, the general contractor or subcontractor must sign and submit the contractor verification statement located in the RDP response report**.**

2. Non-conformance items remain" open" until the contractor verification have been received. When the signed verifications have been received by the RDP, the item will be " closed" distributed with 7 days

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Dewatering facilities and drains.

B. Temporary utilities.

C. Temporary water.

D. Temporary electric power.

E. Temporary heat.

F. Temporary sanitary facilities.

G. Temporary Controls: Barriers, enclosures, and fencing.

H. Enclosure fence for the construction site.

I. Dust control.

J. Vehicular access and parking.

K. Hoists and temporary elevator use

L. Waste removal facilities and services.

M. Construction aids and miscellaneous services and facilities.

N. Environmental protection.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements for submittals.

B. Section 01 3553 - Site Safety and Security Procedures

C. Section 01 5500 - Vehicular Access and Parking.

D. Section 01 5510 - Traffic and Pedestrian Access & Control

E. Section 01 7419 - Construction Waste Management and Disposal

F. Section 01 7000 - Execution progress cleaning and construction layout.

G. Division 31 Earthwork for disposal of ground water at Project site.

1.4 REFERENCE STANDARDS

A. Refer to Section 01 4219 - Reference Standards.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

1.5 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls.

B. Maintain temporary facilities in operable condition.

1.6 SITE PLAN:

A. Show exiting fencing, temporary facilities, utility hookups, staging areas, and parking areas for construction personnel. Location of staging area will be determined by the Owner and Construction Manager.

1.7 REPORTS AND PERMITS:

A. Refer to 01 3000 - Administrative Requirements and 01 4100 - Regulatory Requirements.

1.8 QUALITY ASSURANCE

A. Refer to Section 01 4000 Quality Requirements.

B. Regulations: Refer to 01 4100 Regulatory Requirements.

C. Standards: Refer to 01 4219 Reference Standards.

1.9 PROJECT CONDITIONS

A. General: Each Contractor shall provide each temporary service and facility ready for use at each location, when first needed to avoid delays in performance of work. Maintain, expand as required, and modify as needed throughout the progress of the work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.

B. Conditions of Use: Operate temporary services and facilities in a safe and efficient manner. Do not overload, and do not permit temporary services and facilities to interfere with the progress of work, or occupancy of existing facility. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.

C. Temporary Utilities: Do not permit freezing of pipes, flooding or the contamination of water sources.

D. Temporary Construction and Support Facilities: Maintain temporary facilities in a manner to prevent discomfort to users. Take necessary fire prevention measures. Maintain temporary facilities in a sanitary manner so as to avoid health problems.

E. Security and Protection: Maintain site security and protection facilities in a safe, lawful, publicly acceptable manner. Take measures necessary to prevent site erosion.

1.10 TEMPORARY UTILITIES

A. Edgemont School District will provide the following:
   1. Electrical power consisting of connections to existing facilities.
   2. Water supply, consisting of connections to existing facilities.

B. Provide for all electrical power, lighting, and water required for construction purposes.

C. Existing facilities may be used.

D. New permanent facilities may be used if approved by the Construction Manager.

E. Use trigger-operated nozzles, with back flow devices, for water hoses, to avoid waste of water.

F. Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
   1. Comply with utility company recommendations. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour day basis where required to achieve indicated results in the work and avoid the possibility of damage to work or the temporary facilities at no additional cost to the Owner.
   2. Arrange with the company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
   3. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
      a. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose

1.11 DIVISION OF RESPONSIBILITIES

A. Each Contractor is responsible for the following:
   1. Installation, operation, maintenance, and removal of each temporary facility usually considered as its own normal construction activity, as well as the costs and use charges associated with each facility.
   2. Plug-in electric power cords and extension cords.

3. Supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
4. Special power requirements for installation of its own work such as welding.
5. Its own field office complete with necessary furniture, utilities, and telephone service.
6. Its own storage and fabrication sheds.
7. Temporary telephone service.
8. Temporary heat, ventilation, humidity control, and enclosure of the building where these facilities are necessary for its construction activity but have not yet been installed by the responsible Prime Contractor.
9. All hoisting and fencing for its own work.
10. Collection and disposal, off site, of its own hazardous, dangerous, unsanitary, or other harmful waste material.
11. **Collection and disposal of major equipment removed such as unit ventilators, heaters, fans, toilet fixtures, light fixtures, and other major equipment.**
12. Collection and disposal of major equipment removed such as unit ventilators, heaters , fans, toilet fixtures , light fixtures, and HV equipment.
13. Collection of general waste and debris and disposing into containers provided by the Contract #1 General Construction.
14. Secure lockup of its own tools, materials and equipment.
15. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
16. Temporary Protection for existing flooring, witin and from altered areas to exits.
17. Temporary dust control.

B. The Contract #1 General Construction is responsible and pays all costs for the following:
1. Temporary roads and paving.
2. Temporary toilets, including disposable supplies.
3. First Aid Station and Supplies.
4. Containers for non-hazardous waste and debris this does not include demolition/removals debris for all trades.
5. Temporary enclosure of the building.
6. Project temporary project signs.
7. Disposal of wastes containers.
8. Rodent and pest control.
9. Barricades, warning signs, and lights.
10. Site/construction enclosure fence.
11. Dewatering facilities and drains.
12. Security enclosure and lockup.
13. Construction aids and miscellaneous services and facilities.
14. Temporary dustproof partitions for its own work.
15. Temporary dust control for its own work.

C. Water Service: The Contract #2 Plumbing shall provide and pay all costs to install distribution piping of sizes and pressures adequate for construction .
1. Provide backflow devices to prevent water from re-entering the potable system.
2. Maintaining existing domestic hot and cold water systems, sanitary and storm systems, fire protection systems within the existing building operational at all times for Owner's occupancy and during construction.
3. Applicability: This section applies to all renovation and new construction work areas for this Project.
4. Temporary dustproof partitions for its own work.

5. Temporary dust control for its own work.

D. The Contract #3 Mechanical Contractor is responsible and pays all costs for the following:
   1. Maintaining existing heating system in service during the period between September 15 and June 15. Contractor shall provide all piping, valves, controls, etc., and labor and materials required to maintain operation of existing heating system where affected by the work.
   2. Temporary dustproof partitions for its own work.
   3. Temporary dust control for its own work.

E. Temporary Electric Power Service: Contract #4 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. Applicability: This section applies to all renovation and new construction work areas for this Project.
   2. Connect temporary service to Owner's existing main in the manner directed by Construction Manager.
   3. The 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 and power to be controlled by standard switches per code (outside of power panels) at no additional charge.
   4. 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.
   5. Provide temporary service with an automatic ground-fault interrupter feature, activated from the circuits of the system.
   6. Power Distribution System: Provide circuits of adequate size and proper characteristics for each use. In general run wiring overhead. Rise vertically where wiring will be least exposed to damage from construction operations.
   7. Contract #4 Electrical Contractor shall provide temporary generator power where Owner's electricity in not available. Contractor shall include required fuel for operation.
   8. 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.
   9. Provide overload-protected disconnect switch as required by code.

F. Temporary Lighting: Contract #4 Electrical Contractor shall provide and pay all costs to provide local switching of temporary lighting, spaced to allow lighting to be turned off in patterns to conserve energy, retain light suitable for work-in-progress, access traffic, security check and project lock-up .
   1. Provide not less than on 200-watt lamp per 400 sq. ft. of floor area, uniformly distributed, for general construction lighting, or illumination of a similar nature.
      a. In corridors and similar traffic areas provide one 100-watt incandescent lamp every 50 feet.
      b. In stairways and at ladder runs, provide one lamp per story, located to illuminate each landing and flight.
      c. Provide separate circuitry for corridors, stairways and other travel exits.

G. Whenever an overhead floor or roof deck has been installed, install temporary lighting adequate to provide sufficient illumination for safe work and traffic conditions in every work area

H. Temporary light and power shall be provided 15 minutes before the normal scheduled daily start of any trade and 15 minutes after the normal schedule daily completion of the last trade.

I. The Electrical Contractor shall maintain power and lighting during the normal work week during the hours established by Construction Manager whether or not they fall within established working hours.

1.12 MAXIMUM LOADS

A. General: Lighting and power loads connected to the temporary power distribution system shall be limited to the following maximum individual loads:

	Load	Type	Maximum Size
1.	120 volt	1-phase	1.5 KVA
2.	208 volt	1-phase	2.5 KVA
3.	208 volt	3-phase	5.0 KVA

B. 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 contractor.

1.13 ELECTRIC WELDERS

A. 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.

1.14 USE CHARGES

A. General: Cost for temporary facilities are not chargeable to the Owner, Architect, and Construction Manager. The Owner, Architect, and Construction Manager will not accept a 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.

1. Water Service Use Charges: Water from the Owner’s existing water system may be used without metering, and without payment for use charges.
2. Electric Power and Lighting Service Use Charges: Electric power from the Owner's existing system may be used without payment of use charges. Contractor and Sub-Contractors shall exercise measures to conserve energy usage.
    a. Use of owner electric for items not specific to project (e.g. heating construction shanties, etc.) will not be permitted.
3. All temporary lighting and power to be controlled by standard switches per code (outside of power panels) at no additional charge.
4. Temporary Utility Services: Where Owner's existing services is inadequate or would disrupt owners use of the existing facility, Contract #4 Electrical Contractor shall provide utility services for the temporary use at the project site from the utility company, and pay all costs, including use charges.
5. Each Contractor is responsible for providing adequate utility capacity at each stage of construction for temporary services required under its contract. Prior to availability of temporary utility services at the site, provide trucked-in services for start up of construction operations.
6. Contractor may elect to use alternative temporary services and facilities equivalent to those specified, subject to acceptance by the Architect.

1.15 TELECOMMUNICATIONS SERVICES

A. Each Contractor shall provide and pay for its own telephone service consisting of mobile phone service for all field superintendents and foreman.

B. At Contractor's Field Office location post a list of important telephone numbers, including the following:

1. Local police and fire department.
2. Doctor.
3. Ambulance service.
4. Each Contractor's temporary and home office.
5. Construction Manager temporary and home office
6. Architect's home office.
7. Owner's home office.

8. Principal subcontractors temporary and home office

1.16 TEMPORARY SANITARY FACILITIES

A. Responsibilities: The Contract #1 General Construction is responsible for temporary sanitary facilities and their maintenance, including supplies .

B. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

C. Use of existing facilities is not permitted.

D. Maintain daily in clean and sanitary condition.

E. Sanitary Facilities: Sanitary facilities include temporary toilets. 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.

1. Locate toilets and drinking water fixtures so that no one within the construction area will need to walk more than 2 stories vertically or 200 feet horizontally to reach these facilities.
2. Install self-contained toilets to the extent permitted by governing regulations.
3. Supply and maintain toilet tissue, paper towels, paper cups and other disposable materials as appropriate for each facility for full contract duration. Provide covered waste containers for used material.

1.17 BARRIERS

A. Responsibility: Contract #1 General Construction Contractor shall be responsible for construction barriers required for the project.

B. Barricades, Warning Signs and Lights: Comply with recognized standards and code requirements for erection of substantial, structurally adequate barricades where needed to prevent accidents and losses. Paint with appropriate colors, graphics and warning signs to inform personnel at the site and the public, of the hazard being protected against. Provide lighting where appropriate and needed for recognition of the facility, including flashing red lights where appropriate

1. Sign Materials: For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated. Provide exterior grade acrylic-latex-base enamel for painting sign panels and applying graphics.

C. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and removals .

1.18 FENCING

A. Enclosure Fence: General: Prior to start of excavation or other substantial elements of work begin, install a general enclosure fence with suitable lockable entrance gates. Locate where indicated, or if not indicated, enclose the entire site or the portion of the site determined to be sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except through entrance gates.

1. The Contract #1 General Construction shall provide, maintain and pay all costs for temporary fencing until directed to remove fence from the site

B. Construction: Commercial grade chain link fence.

C. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

D. Locate where indicated, or if not indicated, enclosed portions of the site determined to be sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except through entrance gates.

1. Material:
   a. Steel fencing: Galvanized Chain Link and galvanized gates (non-climbable size).
   b. Fabric: No. 9 GA galvanized, steel wire mesh, furnish one-piece fabric widths for fencing up to 12' in height indicated in the Contract Documents.

c. Framing and Accessories: End, Corner and Pull posts: 2.375" OD steel pipe.
d. Line Posts: Space 10'-0" O.C. maximum. 1.90" steel pipe or 1.875" x 1.625 C-sections.
e. Fence Rails: Locate at top and bottom of fabric. Post brace assembly - manufacturer's standard.
f. Wire ties: For tying fabric to line posts use wire ties spaced 12" O.C.
g. Height: 6'

2. Excavate hole depths approximately 3" lower than post bottom; with bottom of posts set not less than 36" below finish grade surface. The line post holes will be 16" in diameter and 3'-9" in depth filled with set in a compacted mixture of gravel and earth.
   a. Self-supporting fence with movable bases may be used when approved by the Owner's Representative.

1.19 EXTERIOR ENCLOSURES

A. Responsibilities: Contract #1 General Construction is responsible for temporary enclosure.

B. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

C. Provide temporary enclosures where temporary heat is needed and permanent building enclosure is not yet completed, and there is no other provision for containment of temporary heat. Coordinate enclosures with ventilating and material drying or curing requirements to avoid dangerous conditions and adverse effects.

D. Enclosure: Install tarpaulins or equivalent materials securely, using a minimum of metal framing, 4" - 20 ga. metal framing 16" o.c., and ½" plywood plus 6 mil poly for secure and weather tight protection of the school. Individual openings of 16-sq. ft. or less may be closed with plywood or similar materials.
   1. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures where work is being or will be performed, provide translucent tarpaulins made of nylon reinforced laminated polyethylene to admit the maximum amount of daylight and reduce the need for temporary lighting

E. Close openings through floor and roof deck and other horizontal surfaces with substantial load-bearing metal framing or similar construction

1.20 INTERIOR ENCLOSURES

A. Refer to Section 02 2080 Asbestos Abatement for additional requirements.

B. Temporary Dustproof Partitions: Contract #1 General Construction Contractor shall provide dustproof partitions to separate work area from occupied sections of building. Partitions shall be full height metal stud surfaced with minimum 1/2" Type X gypsum board with 2 layers of poly sheeting, overlapped and edges caulked.
   1. Where isolated work is being performed by a Prime Contractor(s) the contractor performing the work shall be responsible for protecting the occupied areas from the work areas as directed by the Construction Manager, including providing dust protection.
   2. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
   3. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
   4. Where temporary wood or plywood enclosure exceeds 100sq. Ft. (9.2 sq. m) in area, use fire-retardant-treated material for framing and main sheathing.

C. Contract #1 General Construction Contractor will install these 9'x12' fire rated temporary partitions at the corridor connection points in the existing building as indicated on drawings. Each location will be equipped with a 3' x 7' hollow metal door and frame with a lockable panic device and door closer.

D. Contractor shall remove and reinstall any devices impacted by temporary partition installation. At conclusion of project the Contractor will again remove and reinstall these devices onto the permanent locations

E. Refer to Section 01 7330 - Selective Removals for additional requirements.

1.21 SITE SAFETY AND SECURITY PROCEDURES

A. See Section 01 3553 See Section 01 3553

1.22 VEHICULAR ACCESS AND PARKING

A. See Section 01 5500.

1.23 WASTE REMOVAL

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Contract #1 General Construction Contractor shall provide containers, at grade, sufficient for the depositing of non- hazardous/non-toxic waste materials, and shall remove such waste materials from project site as required or directed by the Construction Manager.

1. Provide specific containers for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
2. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
3. Contractors shall not utilize the Owner's bins or dumpsters.

C. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

E. Contract #1 General Construction Contractor shall be responsible for daily cleaning up of spillage and debris resulting from its operations and from those of its subcontractors; and shall be responsible for complete removal and disposition of hazardous and toxic waste materials:

1. Broom clean the work area at the end of each work day.
2. Remove liquid spills promptly.
3. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

F. Burying or burning of waste materials on the site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

G. Site: The General Construction Contractor shall maintain Project site free of waste materials and debris.

H. Installed Work: Keep installed work clean. Each Contractor shall clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

I. Concealed Spaces: Each contractor shall remove debris from concealed spaces before enclosing the space.

J. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

1.24 PROJECT SIGNS - See Section 01 5813

1.25 FIELD OFFICES

1.26 TEMPORARY HEAT

A. Temporary Heat: General: Provide temporary heat as required for proper performance of the Work, curing or drying of recently installed work or protection of work in place from adverse effects of low temperatures or high humidity. Select facilities known to be safe and without deleterious effect upon work in place or being installed. Coordinate with ventilation requirements to produce indicated ambient condition required and to minimize consumption of fuel or energy.

1. All temporary heat required within the perimeter of the existing building shall be maintained by the HVAC Contract #3 and costs therefore shall be borne by them and included in the amount quoted in his proposal for all temporary heating described in this section.

2. All other contractors shall be responsible for temporary heat required to comply with the progress schedule and protect their work and materials on the site, but beyond the perimeter or beyond the completed or uncompleted walls of the building or buildings in this project.
3. When the building or a section thereof is enclosed, or when temporary heating is required for the proper progress or protection of the work as determined by the Construction Manager the General Construction Contractor shall provide temporary heating.
4. Maintain a minimum temperature of 55 degF in permanently enclosed portions of the building and areas where finished work has been installed. Refer to individual sections for more stringent requirements.
5. Heating Facilities: Except where conditions make it necessary to use another system, provide properly vented self-contained LP gas heaters with individual space thermostatic control for temporary heat.
    a. Gasoline burning space heaters will not be permitted.
    b. Electric space heaters will not be permitted.
    c. Do not use open burning, electric or salamander type temporary heating units

1.27 HOISTS AND TEMPORARY ELEVATOR USE

A. Each Contractor shall provide facilities for hoisting materials and employees. Do not permit employees to ride hoists which comply only with requirements for hoisting materials. Selection of type, size and number of facilities is the Contractor's option. Truck cranes and similar devices used for hoisting are considered tools and equipment and not temporary facilities.

B. Elevator Use: Owner's existing elevator may not be used by the Contractor.

1.28 MISCELLANEOUS PROVISIONS

A. Temporary Floor Protection: Contract #2 Plumbing shall provide protective floor covering from and within construction work areas to all floors leading to outside the construction area thru all finish area used by the or each Contractor(s).
    1. Heavy-duty, temporary floor protection "Ram Board" reusable and recyclable.
    2. Handling and storage in accordance with manufacturer's recommendations.
    3. Tape all joints
    4. All corridors from renovated areas to exitways, used by Contractors, shall be mopped and left clean daily by the Contract #2 Plumbing Contractor

B. Temporary Roof Drainage: Contract #1 General Construction Contractor shall provide temporary drainage until roof drain replacements are completed or similar waterproof deck construction is completed and prior to connection and operation of permanent drainage piping system
    1. Dispose of rainwater in a lawful manner, which will not result in flooding of the project site or adjoining property, or endanger either permanent work or temporary facilities

1.29 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Clean and repair damage caused by installation or use of temporary work.

B. Restore existing facilities used during construction to original condition.

C. Restore new permanent facilities used during construction to specified condition.

D. Unless the Construction Manager requests that it be maintained for a longer period of time, remove each temporary service and facility promptly when the need for it has ended, or when it has been replaced by authorized use of a permanent facility, or no later than the Date of Substantial Completion. If necessary, restore permanent work which may have been delayed because of interference with the temporary service or facility. Repair damaged work, clean exposed surfaces and replace work which cannot be satisfactorily repaired

E. Remove temporary roads and paving materials not intended for or acceptable for integration into permanent paving. Where the area shown is intended for landscape development, remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the landscape area. Remove

materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances which might impair plant materials or lawns. Repair or replace street paving, curbs and sidewalks at temporary entrances, as required by the governing authority, and/or restore to original condition

PART 2 PRODUCTS - NOT USED

2.1 DE - WATERING FACILITIES AND DRAINS

A. Contract #1 General Construction Contractor is directly responsible for de-watering their excavations. The responsibility of de-watering of the site as to facilitate the work will be the responsibility of the General Construction Contractor coordinate with Construction Manager.

1. Dispose of rainwater in a lawful manner that will not result in flooding project or adjoining property nor endanger permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
2. Remove snow and ice as required to minimize accumulations.

PART 3 EXECUTION -

3.1 TEMPORARY INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required.

B. Each Contractor shall provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

3.2 STAGING

A. All staging 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.

B. Install and maintain staging and appurtenances where roofing and window replacement work is specified until all work and punch list work is complete and approved by the Construction Manager.

3.3 ROOF PROTECTION

A. Each Contractors shall provide temporary protection on any newly installed and existing roof surface when it is necessary for work to take place on completed sections.

3.4 FIRE PREVENTION AND CONTROL

A. Refer to Section 01 3553 - Site Safety and Security Procedures.

3.5 DISCONTINUE, CHANGES AND REMOVAL

A. Each Contractor shall:

1. Discontinue all temporary services required by the Contract when so directed by the Construction Manager.
2. The discontinuance of any such temporary service prior to the completion of the work shall not render the Owner liable for any additional cost entailed thereby and each Contractor shall thereafter furnish, at no additional cost to the Owner, any and all temporary service required by such Contractor(s) work.
3. Remove and relocate such temporary facilities as directed by the Construction Manager without additional cost to the Owner, and shall restore the site and the work to a condition satisfactory to the Owner.

3.6 VENTILATION AND HUMIDITY CONTROL FOR CONSTRUCTION

A. Refer to Section 01 5721 - Indoor Air Quality Controls.

B. Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select

equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

C. Contract #1 General Construction Contractor shall be responsible for 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.

D. Ventilate enclosed area to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.

E. Provide equipment as necessary for air and fresh exchange for the work area per OSHA standards.

F. Remove temporary ventilation equipment prior to the completion of construction.

G. Contract #1 General Construction Contractor will provide negative air machines of sufficient size / qty for square footage of work areas to exhaust any dust / fumes through flexible duct hose to exterior to eliminate any odors/smoke etc. During second shift work, there can be no odors in school the following day.

3.7 ROADS AND PAVED AREAS:

A. Contract #1 General Construction Contractor shall construct and maintain temporary areas adequate to support loads and to withstand exposure to traffic during construction period.

1. Includes access for delivery through staging area to building work areas, and to equipment and storage areas and sheds. Maintenance of existing staging area to prevent / repair any ruts by grading with heavy equipment and placement of import ¾" stone for smooth, stable surface.
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 by 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. General Construction Contractor will clean roads for debris from building-related activities.
6. Snow Plowing: The General Construction Contractor shall provide snow plowing of temporary road, parking areas, access route, and a 5' walkway to General Construction office trailer.
   a. 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.
   b. Owner does not have space for construction parking in existing parking lots or roadways and will subsequently have vehicles in violation of parking prohibitions towed from site and back-charged with all fees to the contractor.
   c. Traffic Regulations:
      a) Access through Owner's entrances shall be limited
      b) Utilize only entrances/temporary roads as designated
      c) Maintain all District traffic regulations
      d) Employee parking to be located as directed by the Construction Manager.

3.8 TRAFFIC CONTROLS

A. Refer to Section 01 5510 - Traffic and Pedestrian Access & Control.

3.9 TEMPORARY SITE SAFETY AND DIRECTIONAL SIGNS:

A. Refer to Section 01 5813 - Temporary Project Signage.

3.10 ENVIRONMENTAL PROTECTION:

A. General Construction Contractor shall provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using 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 Project site.

3.11 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 by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. At the completion of the project, including all punch list item and prior to Substantial Completion, remove all temporary facilities with the approval of the Construction Manager

END OF SECTION

SECTION 01 5500
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Access roads.

B. Parking.

C. Existing pavements and parking areas.

D. Construction parking controls.

E. Flag persons.

F. Traffic signs and signals.

G. Maintenance.

H. Removal, repair.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: For occupancy.

B. Section 01 5000 - Temporary Facilities and Controls.

C. Section 01 5813 - Temporary Project Signage: Post Mounted and/or Wall Mounted Traffic Control and Informational Signs.

PART 2 PRODUCTS

2.1 RESPONSIBILITY

A. Each Contractor is responsiblity for the requirements of this section.

2.2 SIGNS, SIGNALS, AND DEVICES

A. Post Mounted and/or Wall Mounted Traffic Control and Informational Signs: Specified in Section 01 5813 - Temporary Project Signage.

B. Traffic Cones and Drums, Flares and Lights: As approved by Owner's Representative or Construction Manager.

C. Flag Person Equipment: As required by Owner's Representative or Construction Manager.

PART 3 EXECUTION

3.1 ACCESS ROADS

A. Use of designated existing on-site streets for construction traffic is permitted as approved Owner's Representative or Construction Manager.

3.2 PARKING

A. Temporary parking by construction personnel shall be allowed only in areas so designated by the Owner's Representative or Construction Manager.

3.3 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Edgemont School District's operations.

B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through thru raods and parking areas.

C. Prevent parking on or adjacent to access roads or in non-designated areas.

D. Traffic Regulations:

1. Access through Owner's entrances shall be limited.
2. Utilize only entrances/temporary roads as designated.
3. Maintain all District traffic regulations.
4. Construction Employee parking to be located as directed by the Owner's Representative or Construction Manager.

3.4 FLAG PERSONS

A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes whenn directed by the Owner's Representative or Construction Manager.

3.5 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Refer to 01 5813 - Temporary Project Signage for additional requirements.

C. Relocate as work progresses, to maintain effective traffic control.

3.6 MAINTENANCE

A. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.7 REMOVAL, REPAIR

A. Repair existing facilities damaged by use, to original condition.

B. Remove equipment and devices when no longer required.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Maintenance materials, extra materials.

1.3 RELATED REQUIREMENTS

A. Section 00 4401 - Qualification of Bidders.

B. Section 01 1000 - Summary of Contracts.

C. Section 01 2500 - Substitution Procedures: Substitutions made after the Bidding/Negotiation Phase.

D. Section 01 4000 - Quality Requirements: Product quality monitoring.

E. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

F. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.4 REFERENCE STANDARDS

A. ISO 21930 - Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services; 2017.

B. NEMA MG 1 - Motors and Generators; 2017.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.5 DEFINITIONS

A. Refer to General Conditions and Section 01 4216 - Definitions for additional definitions.

B. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

C. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

D. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

E. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

F. Basis-of-Design Or Equal Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," or "or equal", including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service

performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers **shall be submitted as substitutions**.

1. Refer to Section 01 2500 - Substitution Procedures.

G. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

1.6 SUBMITTALS

A. Refer to Section 01 3000 - Administrative Requirements for additional requirements

1.7 ASBESTOS

A. Asbestos: All products, materials, etc., used in conjunction with this Project shall be Asbestos-Free.
   1. Contractor shall provide a certified letter to the Owner's Representative stating that no asbestos containing material has been used in this project. Refer to Section 01 7800 - Closeout Submittals.

B. Each, Contractor, and sub contractors must provide test results upon completion from a New York State accredited testing lab certifying that all material including joint and pipe insulation on this project is non-asbestos.
   1. This certification shall be based on a sampling of 10% of all linear feet of pipe insulation, (unless manufacturer's certificate is submitted).

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Edgemont School District, or otherwise indicated as to remain the property of the Edgemont School District, become the property of the Contractor(s); remove from site.

2.2 NEW PRODUCTS

A. Provide new products for all unless otherwise specifically required or permitted by the Contract Documents.

B. See Section 01 4000 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:
   1. Made outside the United States, its territories, Canada, or Mexico.
   2. Made using or containing CFC's or HCFC's.
   3. Made of wood from newly cut old growth timber.
   4. Containing lead, cadmium, or asbestos.

D. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. Result in less construction waste. See Section 01 7419
   6. Are made of vegetable materials that are rapidly renewable.
   7. Are made of recycled materials.
   8. Are Cradle-to-Cradle Certified.
   9. Have a published Environmental Product Declaration (EPD).
   10. Have a published Health Product Declaration (HPD).

2.3 PRODUCT OPTIONS

A. Refer to Section 00 2113 - Instructions to Bidders for Product/Assembly/System Substitutions.

B. Refer to Section 01 2500 - Substitution Procedures.

2.4 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
   1. Deliver to Owner's Representative; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1 SUBSTITUTION SUBMITTAL PROCEDURE AFTER BIDDING PHASE

A. Refer to Section 01 2500 - Substitution Procedures.

3.2 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.3 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
   1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project roof areas.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.
   1. Execute a formal supplemental agreement between Edgemont School District and Contractor allowing off-site storage, for each occurrence.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 6116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

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 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

C. Requirement for installer certification that they did not use any non-compliant products.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 4000 - Quality Requirements: Procedures for testing and certifications.

C. Section 01 5721 - Indoor Air Quality Controls: Procedures and testing.

D. Section 01 6000 - Product Requirements: Fundamental product requirements, delivery, storage, and handling.

E. Section 07 9200 - Joint Sealants: Emissions-compliant sealants.

F. Section 09 5100 - Acoustical Ceilings.

G. Section 09 9113 - Exterior Painting

H. Section 09 9123 - Interior Painting.

I. Section 09 6500 - Resilient Flooring.

1.4 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:

1. Interior paints and coatings applied on site.
2. Interior adhesives and sealants applied on site, including flooring adhesives.
3. Flooring.
4. Products making up wall and ceiling assemblies.
5. Thermal and acoustical insulation.
6. Free-standing furniture.
7. Other products when specifically stated in the specifications.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:

1. Exterior and interior paints and coatings applied on site.
2. Exterior and interior adhesives and sealants applied on site, including flooring adhesives.
3. Wet-applied roofing and waterproofing.
4. Other products when specifically stated in the specifications.

C. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:

1. Interior of Building: Anywhere inside the exterior weather barrier.
2. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
3. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

D. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.5 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

E. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.

F. GreenSeal GS-36 - Adhesives for Commercial Use; 2013.

G. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).

H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Evidence of Compliance: Submit for each different product in each applicable category.

C. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

D. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.

1.7 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Evidence of Compliance: Acceptable types of evidence are the following;
      a. Current UL (GGG) certification.
      b. Current SCS (CPD) Floorscore certification.
      c. Current SCS (CPD) Indoor Advantage Gold certification.
      d. Current listing in CHPS (HPPD) as a low-emitting product.
      e. Current CRI (GLP) certification.
      f. Test report showing compliance and stating exposure scenario used.
   4. Product data submittal showing VOC content is NOT acceptable evidence.
   5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.

1. Evidence of Compliance: Acceptable types of evidence are:
   a. Report of laboratory testing performed in accordance with requirements.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Aerosol Adhesives: GreenSeal GS-36.
   3. Joint Sealants: SCAQMD 1168 Rule.
   4. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).
   5. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Edgemont School District reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Edgemont School District.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 7000
EXECUTION

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 SECTION INCLUDES

A. Inspections prior to start of work.

B. Examination, preparation, and general installation procedures.

C. Requirements for alterations work, including selective removals and asbestos/lead abatement.

D. General installation of products.

E. Protection of installed construction.

F. Correction of the Work.

G. Pre-installation meetings.

H. Dust control

I. Cutting and patching.

J. Progress and Final cleaning.

K. Protection of installed construction.

L. Starting of systems and equipment.

M. Demonstration and instruction of Edgemont School District personnel.

N. Closeout procedures, including Contractor's Correction Punch List.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 01 5000 - Temporary Facilities and Controls.

E. Section 01 3553 - Site Safety and Security Procedures

F. Section 01 7600 - Procedures and Special Conditions for Separate Prime Contracts.

G. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties.

H. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

I. Section 01 9113 - General Commissioning Requirements: Contractor's responsibilities in regard to commissioning.

J. Section 01 2100 - Allowances.

K. Section 07 8400 - Firestopping.

L. Section 31 2316 - Excavation.

M. Individual Specification Sections:

1.4 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers and Owner's Representative.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous and non-hazardous materials and hazardous waste disposal.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Edgemont School District or separate Contractor.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Effect on work of Edgemont School District or separate Contractor.
      e. Written permission of affected separate Contractor.
      f. Date and time work will be executed.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.7 QUALIFICATIONS

A. Refer to Section Section 01 4401 Qualifications of Bidders and individule specification sections.

1.8 PROJECT CONDITIONS

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Dust Control: Each Contractor shall execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Contract #1 General Construction Contractor shall provide dust-proof barriers between construction areas and non construction areas inside or outside the construction areas

C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Outdoors: Limit conduct of especially noisy exterior work to hours within the local Noise ordinances.

D. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

1.9 COORDINATION

A. See Section 01 1000 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

C. Notify affected utility companies and comply with their requirements.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. After Edgemont School District occupancy of premises. Coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Edgemont School District's activities.

G. General: Each Contractor includes general coordination of the entire work of the project, including preparation of general coordination drawings, diagrams and schedules and control of site utilization from the beginning of construction activity through project closeout and warranty periods .

H. Alterations: Where applicable, requirements of the contract documents apply to alteration work in the same manner as to new construction. Refer to drawings for specific requirements of alteration work. Primarily, alterations can be described as normal architectural, mechanical and electrical alterations. Contractors shall review phasing and scheduling of the work to understand that certain areas of work must be completed and occupied prior to start of other work. This is essential to the Owner in their ability to maintain the educational programs during construction.

1.10 CODES, PERMITS, FEES, ETC.

A. Refer to Section 01 4100 Regalatory Requirements

PART 2 PRODUCTS

2.1 MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 2500 - Substitution Procedures.

2.2 SITE SCOPING

A. Site Scoping shall be the responsibility of the Contract #1 General Construction Contractor.
   1. Provide scsoping near Gas Rig.

B. Call ProTek (718) 472-2304 or info@ProTekLocating.com, before beginning any excavation at least five (5) working days prior to the start of construction, and locate and identify all underground utilities etc.

C. Submit two copies signed by scoping firm indication of all piping locations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Notify Owner's Representative of any discrepancies immediately in writing before proceeding to lay out the work. Locate and protect existing benchmarks and base line. Preserve permanent reference points during construction.

B. Prior to start of construction take photographs, video's or similar documentation as evidence of existing project conditions as follows:
   1. Interior views: Each room and areas of outside or within the work area which could be construded as caused by the contractor.
   2. Exterior views: Each area of work outside and adjacent to the work area which could be construded as caused by the contractor.

C. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

D. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

E. Examine and verify specific conditions described in individual specification sections.

F. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

G. Verify that utility services are available, of the correct characteristics, and in the correct locations.

H. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Owner's Representative and Construction Manager five (5) working days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with one copies to Owner's Representative, Architect, Consultant, and Construction Manager, participants and those affected by decisions made.

3.4 REMOVAL AND DUST CONTROL

A. The following procedures shall be followed when removals are performed:
   1. Asbestos and lead containing material shall be removed as per asbestos and lead abatement sections of the specifications.
      a. Refer to Section 02 2080 Asbestos Removal and Disposal
   2. Exterior
      a. Work must be in compliance with OSHA Construction Standard (29 CFR 1926.62).
      b. Windows directly below, above and adjacent to the work area shall be closed.
      c. Provide tarps on the outside of the building to catch all dust, debris and paint chips when items are being removed and installed.
   3. Interior:
      a. Floor surfaces protection as specified in Section 01 5000 - Temporary Facilities and Controls.
      b. All air vents in the room shall be closed, shut off and sealed.
      c. Access to all rooms undergoing removals shall be restricted to prevent unauthorized entry.
      d. All TV’s, smart boards, furniture, books and clocks, moveable objects will be removed as indicated in Setion 01 1000 Summary of Work. Items to remain, including fixed furniture, etc. shall be cover with a six mil plastic by each trade in their areas(s) of work..
   4. Contract #1 General Construction Contractor shall provide labor for daily cleanup on the interior and the exterior of the building as required or directed by the Owner's Representative and Construction Manager. Any visible debris shall be removed prior to occupancy the following day.
   5. All debris shall be disposed of properly in accordance with Federal, State and Local Regulations. Refer to Section 01 5000 - Temporary Facilities and Controls and asbestos and lead abatement sections for containers required.

6. Do not leave any openings unprotected at end of work day or during periods of excessive cold weather or precipitation.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Saw cut all concrete slabs.

E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

F. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

G. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Owner's Representative before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 .

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to Contract #2 Plumbing, Contract #3 Mechanical, and Contract #4 Electrical): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Where existing active systems serve occupied facilities but are to be replaced with new services, **schedule replacement only until new units are on site.**
      a. Remove existing systems and install only after scheduling with the Owner's Representative in order to minimize duration of outages to units serving occupied areas.
         a) **Units serving occupied areas shall be replace after school, Saturday, Sundays and Holiday and must be completed prior to occupancy. At no time shall occupied areas be without code complying heating or ventilation**
      b. See Section 01 1000 - Summary of Contracts for other limitations on outages and required notifications.

c. Provide temporary connections as required to maintain existing systems in service.
d. Perform all switchovers, shutdowns, etc after hours, weekends, holidays or times when the building is not occupied. All switchover scheduling shall be approved by the Owner's Representative.

2. Verify that abandoned services serve only abandoned facilities.
3. Remove conduits, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
2. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Owner's Representative and Architect review and request instructions.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Do not begin new construction in alterations areas before removals is complete.

J. Comply with all other applicable requirements of this section.

3.7 CUTTING AND PATCHING

A. This Section includes procedural requirements for cutting and patching.

B. Contractor acknowledges that the work involves renovation and alteration of existing improvements and, therefore, cutting and patching of the work is essential for the Project to be successfully completed. Contractor shall perform any cutting, altering, patching and fitting of the work necessary for the work and the existing improvements to be fully integrated and to present the visual appearance of an entire, completed, and unified project. In performing any work which requires cutting, fixing, or patching, Contractor shall use its best efforts to protect and preserve the visual appearance and aesthetics of the project to the reasonable satisfaction of both the Owner's Representative and Architect.

C. Each Contractor shall do all cutting, patching, repairing as necessary for their work. In all cases, the cutting, patching, repairing and finishing shall be performed mechanics skilled in the particular trade required at no additional cost to the Owner.

D. Whenever possible, execute the work by methods that avoid cutting or patching.

E. See Alterations article above for additional requirements.

F. Refer to other Sections for specific requirements and limitations applicable to cutting and patching.

G. Refer to various sections and divisions for other requirements and limitations applicable to cutting and patching.

H. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.

6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

I. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

J. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

K. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

L. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition. A sufficient time in advance of the construction of new walls, floors, pavement, or roofing etc. Each Contractor shall be responsible for properly locating and providing in place all sleeves, inserts and forms required for work.

M. Cutting: All cutting of holes in existing existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. .

1. Whenever possible, execute the work In general, use hand or small power tools designed for sawing and 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. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete/Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Section 31 2316 - Excavation where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. All cutting of holes in existing walls, existing floors, existing roofs, and existing ceilings, etc. for the removal of any existing work (including, but not limited to ducts, fans, fixtures, motors, equipment, drains, wiring, conduit, etc.) or for the installation of any new work shall be done in a neat manner by the Contractor. Debris caused by such cutting or removals will be removed by each Contractor unless noted otherwise.
7. Where sleeves, inserts or openings are required in existing walls, floors, and roofs of existing buildings or structures, all necessary cutting, furnishing and installing of sleeves, inserts, lintels, etc., shall be done by each Contractor unless noted otherwise.

N. All surfaces where existing items are removed from existing pavements, etc. shall be patched to match existing surfaces by each contractor.

1. Proceed with patching after construction operations requiring cutting are complete.

O. Restore work with new products in accordance with requirements of Contract Documents.

P. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

Q. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of

uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

R. Patching:

1. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
2. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
3. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
4. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
5. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

S. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

1. Match color, texture, and appearance.
2. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.8 SPECIAL REQUIREMENTS

A. All existing systems are required and shall remain operational during the performance of the work.

B. Notwithstanding anything contained in the Contract Documents to the contrary, the Contractor(s) shall not be permitted to disrupt operation of any building system or any of the services without Owner's Representative's prior written consent, which shall not be unreasonably withheld. Any request to perform such work shall be in writing, received by Owner's Representative no less than five (5) working days prior to the commencement of the request for disruption, and shall detail:

1. The exact nature and duration of such interruption;
2. The area of the Building affected, and;
3. Any impact upon the Construction Schedule caused by such proposed temporary disruption. All Work shall be performed during the hours and on the days set forth in the Specifications.

3.9 MISCELLANEOUS PROVISIONS:

A. Except as otherwise indicated comply with applicable requirements of Division-22, 23, and 26 sections for mechanical provisions within units of general Divisions 2-14, 31,-33 work. Except as otherwise

indicated, comply with applicable requirements of Division-22-26 sections for electrical provisions within units of general (Divisions 2-14) work.

B. Service Connections: Refer to Division-22, 23 and 26 sections for the characteristics of the mechanical and electrical services to be connected to units of general work. Provide units manufactured or fabricated for proper connection to and utilization of available services, as indicated. Except as otherwise indicated, final connection of mechanical services to general work is defined as being mechanical work, and final connection of electrical services to general work is defined as electrical work.

3.10 FIRE PREVENTION AND CONTROL

A. Refer to Section 01 3553.

3.11 WATCHMAN

A. The Owner will not provide watchman. Each Contractor will be held responsible for loss or injury to persons or property or work where his work is involved and shall provide such watchman and take such precautionary measures as he may deem necessary to protect his own interests.

3.12 SECURITY SYSTEM

A. Refer to 01 3553 - Security Procedures

3.13 VERIFICATION OF CONDITIONS

A. All openings, measurements, door frames, existing conditions and other similar items or conditions shall be field measured prior to submission of any shop drawings or manufacturers literature for approval.

1. Each Contractor shall investigate each space into and through which equipment must be moved. Equipment shall be shipped from manufacturer in sections, of size suitable for moving through restricted spaces. Where sectional fabrication and or delivery cannot be achieved, openings, enlargements etc shall be provided by Each contractor whose equipment requires access, at no additional cost to the Owner.

3.14 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

E. Each Contractor is responsible for own daily debris removal into containers provided by the Contract #1 General Construction Contractor. Working areas are to be broom swept on a daily basis by the Contract #1 General Construction Contractor.

F. Each Contractor is is responsible to provide dust protection for their construction-related activities.

G. If daily cleaning and dust protection is not provided the Contractor will be back charged for cleanup performed by employees of the Owner's Representative or a separate contractor retained by the Owner's Representative.

3.15 PROTECTION OF INSTALLED WORK

A. Each Contractor is responsible to provide protection for their work.

B. Protect installed work from damage by construction operations.

C. Provide special protection where specified in individual specification sections.

D. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

E. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

F. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

G. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

1. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Prohibit traffic from landscaped areas.

I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.16 SYSTEM STARTUP

A. Coordinate with requirements of Section 01 9113 - General Commissioning Requirements.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify Owner's Representative seven days prior to start-up of each item.

D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.17 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

3.18 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, balancing and Adjusting HVAC. See Division 23.

3.19 FINAL CLEANING

A. Final cleaning shall be the responsibility of each contractor and all costs for final cleaning shall be included in the Base Bid. Final cleaning responsibility shall be limited to all areas where renovations occur.

B. Execute final cleaning prior to Substantial Completion.

C. Use cleaning materials that are nonhazardous.

D. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces

E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

F. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

G. Replace filters of operating equipment.

H. Clean debris from roofs.

I. Clean site; sweep paved areas, rake clean landscaped surfaces.

J. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

K. Areas being altered or renovated by each prime only for their work shall be cleaned by the Contractor working in the area. Example: Intercom system or fire alarm system being replaced in classrooms or areas not being altered; unit ventilators, convectors, controls, etc. being replaced altered, etc., plumbing fixtures installed in classrooms not being altered.

L. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

M. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

N. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

O. Remove tools, construction equipment, machinery, and surplus material from Project site.

P. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

Q. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

R. Sweep concrete floors broom clean in unoccupied spaces.

S. Remove labels that are not permanent.

T. Touch up and otherwise repair and restore marred, exposed finishes and surfaces evidence of repair or restoration. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show

U. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

V. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

W. Leave Project clean and ready for occupancy.

X. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

3.20 CLOSEOUT PROCEDURES

A. Refer to Section 01 7800

3.21 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

END OF SECTION

SECTION 01 7310
CUTTING AND PATCHING

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. Whenever possible, execute the work by methods that avoid cutting or patching.

B. This Section includes procedural requirements for cutting and patching.

1. Refer to other Sections for specific requirements and limitations applicable to cutting and patching.
2. Requirements of this Section apply to all contracts. Refer to various sections and divisions of these specifications for other requirements and limitations applicable to cutting and patching.
3. Contractor acknowledges that the work involves renovation and alteration of existing improvements and, therefore, cutting and patching of the work is essential for the Project to be successfully completed. Each Contractor shall perform any cutting, altering, patching and fitting of the work necessary for the work and the existing improvements to be fully integrated and to present the visual appearance of an entire, completed, and unified project. In performing any work which requires cutting, fixing, or patching, Contractor shall use its best efforts to protect and preserve the visual appearance and aesthetics of the project to the reasonable satisfaction of both the Owner and the Architect.
4. Each Contractor shall do all cutting, patching, repairing as necessary for their work In all cases, the cutting, patching, repairing and finishing shall be performed by mechanics skilled in the particular trade required at no additional cost to the Owner.

1.3 RELATED SECTIONS

A. Division 1 Section "Selective Removals" for removals of selected portions of the building for alterations.

B. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.

C. Divisions 2 through 14 Sections for additional requirements and limitations applicable to cutting and patching individual parts of the Work.

D. Requirements in this Section apply to each contractor and installations. Refer to all Division Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.4 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.5 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching; show how they will be performed, and indicate why they cannot be avoided.
2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate 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 and those that will be temporarily out of service. Indicate how long service will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.6 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
1. Primary operational systems and equipment.
a. Air or smoke barriers.
b. Fire-protection systems.
c. Control systems.
d. Communication systems.
e. Conveying systems.
f. Electrical wiring systems.
g. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
1. Water, moisture, or vapor barriers.
a. Membranes and flashings.
b. Exterior curtain-wall construction.
c. Equipment supports.
d. Piping, ductwork, vessels, and equipment.
e. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

B. Prior to cutting and patching verify with Construction Manager all existing warranties in effect.
1. Portions of the exist roofs are under warranty. Work must be reviewed and approved by the manufacturer of the warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

B. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

B. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition. A sufficient time in advance of the construction of new walls, floors, pavement, or roofing etc. Each Contractor shall be responsible for properly locating and providing in place all sleeves, inserts and forms required for work.

C. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete/Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

D. All cutting of holes in existing walls, existing floors, existing roofs, existing ceilings, etc. for the removal of any existing work (including, but not limited to ducts, fans, fixtures, motors, equipment, drains, wiring, conduit, etc.) or for the installation of any new work shall be done in a neat manner by each Contractor. Debris caused by such cutting or removals will be removed by each Contractor.

E. Where sleeves, inserts or openings are required in existing walls, floors, roofs, vaults and pavements of existing buildings or structures, all necessary cutting, furnishing and installing of sleeves, inserts, lintels, etc., shall be done by each Contractor.

F. Contractor(s) are hereby notified that the existing walls in the existing building are concrete mansory unit. All openings in existing walls shall be provided with steel lintels, minimum 4" bearing each side and 8" wide x wall thickness concrete masonry units filled solid on each side of the opening for proper support.

G. Adequate blocking, fastening, etc., required to support equipment, casework, etc., from existing terra cotta walls shall be included as required to complete work.

H. All surfaces where existing items are removed from existing walls, floors, ceilings, roofs, vaults, etc. shall be patched to match existing surfaces.

1. All patching shall be provided with prime and finish paint or other material to match existing. In areas indicated to be completely painted/finished by the Contractor for Construction , other prime contractors shall be required only to patch existing surfaces to match as required to accept new finishes.
2. Proceed with patching after construction operations requiring cutting are complete.

I. Removals of selected portions of the building for alterations is included in Section "Selective Removals".

J. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

3.4 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 paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01 7330
SELECTIVE REMOVALS

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 DESCRIPTION OF WORK:

A. Location of selective removal work is indicated on drawings only in a general manner and it is not all inclusive in the overall scope of removal work. Each Contractor shall provide all inclusive removals required for new and renovated work.
   1. Each Contractor will be responsible for all related removals and re-work of the existing systems, as required for new work.

1.3 SUMMARY

A. This Section includes but is not limited to the following by each Prime Contractor unless noted otherwise:
   1. Removal of asbestos containing material. (Contract #1 General Construction).
   2. Removals of selected portions of a building or structure.
   3. Removal of selected site elements. (Contract #1 General Construction).
   4. Repair procedures for selective removals operations.
   5. Removals of concrete and curbs.
   6. Removal of portions of existing building indicated on drawings and as required to accommodate new construction.
   7. Removal of concrete walls and masonry etc. indicated to be removed or required for new construction.
   8. Excavation, backfill, concrete slab etc. indicated in the existing building shall be performed by each contractor. Refer to Special Notes for each contractor in Section 01 1000 - Summary of Contracts.
   9. Removal of interior partitions, flooring, and ceilings.
   10. Removal of doors and frames. (Contract #1 General Construction).
   11. Existing framing etc. indicated to be removed or required. (Contract #1 General Construction).
   12. Cutting of new openings where indicated and /or required to accommodate new work.
   13. Firestopping as specified in Section 07 8400 - Firestopping.
   14. Cutting concrete floors and masonry walls for piping, ducts, and conduits.
   15. Cutting concrete floors excavation, back-fill, concrete slab, etc. in the existing building shall be performed by each contractor.
   16. Removal of existing equipment piping, ducts, and conduits.
   17. Cutting, and removals required for installation of existing and new ventilation and electrical.
   18. Relocation of pipes, conduits, ducts, and other mechanical and electrical work.
   19. Patching of all areas of cutting and removals.
   20. Refer to Divisions 22, 23, and 26 for additional selective removals required by each respective plumbing, mechanical and electrical contractor.

1.4 RELATED SECTIONS:

A. Section 01 1000 - Summary of Contracts for use of the premises and phasing requirements.

B. Section 01 3000 - Administrative Requirements.

C. Section 01 5000 - Temporary Facilities and Controls.

D. Section 01 7000 - Execution: Cutting and Patching and Progress Cleaning

E. Section 01 7310 - Cutting and Patching for cutting and patching procedures for selective removals operations.

F. Section 01 7900 - Demonstration and Training

G. Section 01 9113 - General Commissioning Requirements - Contractor's responsibilities in regard to commissioning.

H. Section 07 8400 - Firestopping.

I. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.

J. Division 22, 23, and 26 Sections for removals and relocating mechanical items.

K. 31 1000 - Site Preparation and Clearing

L. Section 31 2316 - Excavation.

1.5 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 Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall where indicated.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled..
   1. Protect construction indicated to remain against damage and soiling during selective removals.

D. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.6 SUBMITTALS

A. Refer to Section 01 3000 - Administrative Requirements for submittal procedures.

B. Refer to Section 01 1010 - Milestone Schedule for Sequence of Work.

C. Each Contractor shall:
   1. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
   2. Schedule of selective removals activities: Indicate the following:
      a. Detailed sequence of selective removals and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
      b. Interruption of utility services.
      c. Coordination for shutoff, capping, and continuation of utility services.
      d. Locations of temporary partitions and means of egress.
      e. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

1.7 QUALITY ASSURANCE

A. Professional Engineer Qualifications: Comply with Division 1 Section "Quality Requirements."

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Pre Removal Conference: All Contractors shall attend the conference at Project site to comply with requirements in Section 01 3000 - Administrative Requirements. Review methods and procedures related to selective removals including, but not limited to, the following:
   1. Inspect and discuss condition of construction to be selectively removed.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective removals 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 removals operations.

D. QUALITY ASSURANCE

E. PROJECT CONDITIONS

1. Owner assumes no responsibility for condition of areas to be selectively removed.
   a. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

F. WARRANTY

1. Refer to Section 01 7800 - Closeout Submittals.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Refer to Section 01 7000 - Execution for cutting and patching.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective removals required.

C. 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 Owner's Representative.

3.2 UTILITY SERVICES

A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective removals operations.

1. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner's Representative . Provide temporary services during interruptions to existing utilities, as acceptable to Owner's Representative .
   a. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.
2. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
3. Utility Requirements: Refer to Division 22, 23, and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective removals work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Provide temporary weather protection, during interval between selective removals of existing construction on exterior surfaces and new construction, INCLUDING BUT NOT LIMITED TO REMOVAL OF EXISTING ROOFING, REMOVAL OF EXISTING FACE BRICK AND REMOVAL OF EXISTING MASONRY CAVITY WALLS, CONCRETE WALLS AND SIMILAR CONSTRUCTION, to prevent water leakage and damage to structure and interior areas.

B. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective removals operations.

C. Cover and protect furniture, furnishings, and equipment that have not been removed.

D. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

E. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
   1. Temporary Shoring: Provide and maintain interior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
      a. Strengthen or add new supports when required during progress of selective removals.

F. The following procedures shall be followed when ceilings, partitions, roofing, face brick, masonry, and cavity walls are removed and do not contain asbestos: (Asbestos and lead containing material shall be removed as per asbestos and lead abatement sections of the specifications).
   1. Work must be in compliance with OSHA Construction Standard (29 CFR 1926.62)..
   2. Each Contractor shall provide and pay all costs for:
      a. Windows directly below, above and adjacent to the work area shall be closed.
      b. All existing casework, fixed furniture and similar shall be provided one layer of six mil plastic.
      c. All air vents in the room shall be closed and/or shut off and sealed.
      d. Access to all rooms undergoing removals shall be restricted to prevent unauthorized entry.
      e. All moveable objects will be moved from the room by the Owner. The Contractor shall cover floor with a drop cloth or similar protection approved by the Construction Manager
      f. All corridors used by all Contractors shall be protected and mopped and left clean daily.
      g. Provide labor for daily cleanup on the interior and exterior of the building as required or directed by the Owner's Representative. Refer to Section 01 5000 - Temporary Facilities and Controls for additional requirements Any visible debris shall be removed on a daily basis. Only wet cleaning methods and/or HEPA vacuuming shall be used to clean.
      h. At completion of the work in each area the area shall be HEPA vacuumed and wet wiped.

3.4 SELECTIVE REMOVALS

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 removals systematically, from higher to lower level. Complete selective removals 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 removals 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.
10. Return elements of construction and surfaces that are to remain to condition existing before selective removals operations began.
11. Existing Facilities: Comply with Owner's Representative's requirements for using and protecting elevators and loading docks and other building facilities during selective removals operations.
12. Removed and Salvaged Items: Comply with the following:
    a. Clean salvaged items.
    b. Store items in a secure area until delivery to Owner's Representative.
    c. Transport items to Owner's Representative's storage area on-site in area designated by Owner's Representative.
    d. Protect items from damage during transport and storage.
13. Removed and Reinstalled Items: Comply with the following:
    a. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
        a) Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
14. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective removals. When permitted by Owner's Representative, items may be removed to a suitable, protected storage location during selective removals, cleaned, and reinstalled in their original locations after selective removals operations are complete.
15. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
16. Roofing: Remove no more existing roofing than can be covered in one day by new roofing. Refer to applicable Division 7 Section for new roofing requirements.

3.5 PATCHING AND REPAIRS Refer to Section 01 7000 and 01 7310

3.6 SPECIAL REQUIREMENTS

A. All existing systems are required and shall remain operational during the performance of the work.

B. Notwithstanding anything contained in the Contract Documents to the contrary, the contractor(s) shall not be permitted to disrupt operation of any building system or any of the services without Construction Manager's prior written consent, which shall not be unreasonably withheld. Any request to perform such work shall be in writing, received by Construction Manager no less than five (5) working days prior to the commencement of the request for disruption, and shall detail:
    1. The exact nature and duration of such interruption;
    2. The area of the Building affected, and;
    3. Any impact upon the Construction Schedule caused by such proposed temporary disruption. All Work shall be performed during the hours and on the days set forth in the Specifications.
    4. All required shutdowns shall be performed after hours or weekend.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Refer to Section 01 5000 - Temporary Facilities and Controls.

B. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

C. Burning: Do not burn demolished materials.

D. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.8 CLEANING

A. Refer to Section 01 7000 - Execution.

END OF SECTION

SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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 WASTE MANAGEMENT REQUIREMENTS

A. Edgemont School District requires that this project generate the least amount of trash and waste possible.

B. Each shall be responsible for Construction Waste Management

C. Each Contractor shall collect and dispose of waste material into containers provided by Contract #1 General Construction Contractor

D. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

E. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

F. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:

1. Aluminum and plastic beverage containers.
2. Corrugated cardboard.
3. Wood pallets.
4. Clean dimensional wood.
5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 1000 - Site Preparation and Clearing for use options.
6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
7. Gypsum drywall and plaster.
8. Plastic buckets.
9. Paint.
10. Mechanical and electrical equipment.
11. Fluorescent lamps (light bulbs).
12. Acoustical ceiling tile and panels.

G. Each Contractor shall submit periodic Waste Disposal Reports to Owner's Representative; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

H. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site.
2. Burying on the project site.
3. Dumping or burying on other property, public or private.
4. Other illegal dumping or burying.

I. Regulatory Requirements: Each Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 7000 - Execution: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

E. Section 32 9220 - Restoration of Turf Areas.

1.4 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
2. Submit Report on a form acceptable to Owner's Representative.
3. Landfill Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.

c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

4. Incinerator Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
   c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner's Representative, Architect, or Construction Manager.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7420
SITE WASTE HANDLING AND DISPOSAL

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 SECTION INCLUDES

A. Handling, transport and off-site disposal of solids including excess soils from the excavations, sediments, construction debris and liquids.

1.3 RELATED SECTIONS

A. Section 01 7330 - Selective Removals.

B. Section 01 7419 - Construction Waste Management and Disposal

C. Section 31 2316 - Excavation.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. The Contractor shall obtain waste characterization profiles for off-site disposal of all waste materials and shall obtain any required permits.

B. The Contractor shall certify in writing that:

1. The facility(s) receiving each shipment of materials from the site(s) is licensed and approved by the appropriate state and federal agencies to accept the materials shipped.
2. The facility(s) will provide the treatment and/or disposal services indicated.
3. The facility(s) has sufficient capacity to and will accept the quantities of waste materials, debris and contaminated materials to be generated under this Contract within the period of performance of this Contract.

3.2 HANDLING AND DISPOSAL

A. Unless other arrangements have been made with the Construction Manager, all solid material must be promptly removed from the site at the end of each workday. The excess soils from the construction site that cannot utilized on the project fall into this category. During the excavation, if any material appears to be contaminated by the presence of discoloration and or odorous, shall be stored separately for other material for off-site disposal. All other excavated soils that appear to be clean shall be incorporated into the construction for backfill.

B. Only at the discretion of Construction Manager and Geo-Tech Engineer may solid material be temporarily stored near an excavation area. All excavated material shall be secured in weatherproof containers, or secured on and covered by 6 mil polyethylene sheets with erosion control measures. At the end of each day's activities, the Contractor shall transfer soil either to a storage area located in an area as directed by the Construction Manager and Geo-Tech Engineer , or hauled off site. All material stored on site shall be protected from weather. No waste material shall be permitted to be held on-site for more than thirty (30) days.

C. Soil and construction debris must be transported by the Contractor to a licensed off-site disposal facility. All stored material must be protected from the weather. The Contractor shall collect waste classification samples, if required by the disposal facilities.

Any and all contaminated soils shall be transported by the Contractor to an off-site treatment/recycling facility. Such treatment may include thermal, asphalt batching or bioremediation processes. Certificates of destruction must be delivered to the Construction Manager and Geo-Tech Engineer immediately after treatment of the soils.

D. Prior to the transporter leaving the site, the Contractor shall prepare and provide the Construction Manager with copies of waste manifests for each shipment of wastes leaving the site(s).

E. Within three (3) days of return to the Contractor, the Contractor shall provide the Construction Manager and Geo-Tech Engineer with copies of completed waste manifests and certificates of destruction indicating that each waste shipment has been received at the waste disposal facility and properly treated.

1. Should any waste manifest or certificates of destruction not be returned within two (2) weeks of shipment, the Contractor shall initiate follow-up and shall document its follow-up efforts in an appropriate report prepared under this paragraph which shall be furnished to the Construction Manager and Geo-Tech Engineer .

F. Marking, labeling, placarding, packaging and manifesting wastes shall be in accordance with all local, state and federal regulations prior to transport off-site.

G. The Contractor shall provide the empty and full weights of all transporters carrying solid materials from the site(s). A written scale receipt shall be provided to the Owner/Engineer within twenty-four (24) hours after a full transporter leaves the site.

1. When a transporter carrying liquid leaves the site, the Contractor shall provide the number of gallons to the Construction Manager.

H. No waste or other materials shall remain on-site following site cleanup and Contract closeout. No waste material shall be stored on-site for more than thirty (30) days. Off-site storage of waste materials will not be paid for by the Architect and Construction Manager but shall be at the Contractor's expense.

I. The Contractor shall comply with all applicable regulatory requirements listed as well as other applicable federal, state or local laws, codes and ordinances that govern or regulate hazardous and/or non hazardous wastes.

3.3 WASTE MATERIAL TO BE HANDLED BY THE CONTRACTOR

A. Solid Material:

1. Excess soils from excavations to be shipped to an off-site disposal facility;
2. Excavated contaminated soil to be shipped to an off-site treatment facility;
3. Removed and cleaned metal objects such as petroleum storage tank(s), piping and associated appurtenances to be shipped to a metal recycler;
4. General excavation debris such as demolished concrete, asphalt, large rocks and boulders to be shipped to an off-site construction debris landfill.

B. Liquid Material:

1. Wash-water generated from washing down heavy equipment, sampling equipment and decontamination activities to be transported to an off-site treatment facility;
2. Petroleum product and sludges from tank(s) and pipeline cleaning operations to be transported to an approved off-site treatment/recycling facility;
3. Petroleum contaminated groundwater from the tank(s) excavation to be treated on-site or transported to an approved off-site treatment facility;

C. Disposable Health and Safety Equipment:

1. Material generated by, Contractor and its subcontractors to be shipped to a licensed off-site facility.

END OF SECTION

SECTION 01 7600
PROCEDURES AND SPECIAL CONDITIONS FOR SEPARATE PRIME CONTRACTS

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 DESCRIPTION OF WORK

A. The types of minimum requirements for procedures and performance or control work of a general nature, to be fulfilled collectively by Prime Contractors, and must be participated in by each Prime Contractors (where applicable) even though certain lets of work may be assigned to a specific Prime Contractors.

1.3 USE OF PREMISES

A. Refer to Section 01 1000 - Summary of Contracts.

1.4 MISCELLANEOUS PROVISIONS:

A. Except as otherwise indicated comply with applicable requirements of Division-22 and 23 sections for mechanical provisions within units of general (Divisions 2-14) work. Except as otherwise indicated, comply with applicable requirements of Division- 26 and 28 section for electrical provisions within units of general (Divisions 2-14) work.

B. Service Connections: Refer to Division-22, 23, and 26 sections for the characteristics of the mechanical and electrical services to be connected to units of general work. Provide units manufactured or fabricated for proper connection to and utilization of available services, as indicated. Except as otherwise indicated, final connection of mechanical services to general work is defined as being mechanical work, and final connection of electrical services to general work is defined as electrical work.

1.5 DISSIMILAR METAL

A. Wherever dissimilar metals would otherwise come in contact with each other, they must be isolated by use of an approved, permanent non-staining material. Where one of the metals is aluminum, a coat of zinc-chromate primer followed by a coat of alkali-resistant bituminous paint shall be applied.

1.6 MODIFICATION OF WORK

A. Where necessary, because of job or space conditions, the Contractor shall modify his work to suit these conditions, within accepted standards and limitations. No allowance will be made for this modification. .

1. If work is executed without regard for other trades as cited above, the Architect may direct its removal and modification. No allowance will be made for this work.

1.7 ACCESSIBILITY, SIZE AND LOCATION OF EQUIPMENT AND WORK

A. Each Contractor shall investigate each space into and through which equipment must be moved. Equipment shall be shipped from manufacturer in sections, of size(s) suitable for moving through restricted spaces.

B. Each Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and sizes of duct enclosures, for the proper installation of his work. They shall cooperate with the all other contractors whose work is in the same spaces and shall advise the Construction Contractor of their requirements. Such spaces and clearances shall, however, be kept to the minimum size required.

C. Each Contractor shall locate all equipment, which must be serviced, operated or maintained in fully accessible positions. Equipment shall include, but not be limited to: valves, traps, cleanouts, motors, controllers, switch-gear, and drain point etc. Minor deviations from drawings may be made to allow for better accessibility, but changes of magnitude or which involves extra cost shall not be made without approval.

1.8 ACCESS DOORS

A. Provide all access doors for all dampers, valves, cleanest, junction boxes, pull boxes or similar items located above finished ceilings or ceiling breaks or extensions, behind finished walls or below finished floors. The access doors shall be stainless steel or steel, hinged types as required for type of construction.steel, hinged types as required for type of construction.

1. Where feasible locate all dampers, valves, cleanest, junction boxes, pull boxes or similar items above acoustical tile ceiling.
2. Provide where required:
    a. Wall and ceiling access door and frame units.
    b. Floor access door and frame units, interior.
    c. Access door and frame units, fire-rated and non-fire-rated, in wall, ceiling, and floor locations.
3. Group together concealed boxes, control valves, dampers and other mechanical and electrical equipment requiring access for operation, maintenance and repair, to reduce number of access doors required.
4. Group together concealed boxes, control valves, dampers and other mechanical and electrical equipment requiring access for operation, maintenance and repair, to reduce number of access doors required.
5. Where electric motors or heaters are installed above hung ceilings, provide disconnect switch in hung ceilings within reach from access doors, unless switch is located on wall immediately below.
    a. Disconnect switch shall be provided by the Contractor furnishing the equipment unless shown otherwise.
6. All access doors in Toilets, Janitor Closets, and Kitchen and Food Related Areas and similar spaces shall be watertight and constructed completely of stainless steel type 302.
7. In new construction each contractor shall furnish the access dorr(s) to the General Construction Contractor for instalation. In existing construction each Prime Contractor shall furnish and install.

1.9 MACHINERY GUARDS

A. Moving parts of machinery exposed to contact by personnel shall be guarded by a barrier of a type a approved by the Architect.

1. Exposed moving parts such as belts and couplings shall have 3/4" No 16 gauge galvanized expanded metal mesh guards, with all edges rounded. Guards shall be 1-1/2" x 1-1/2" x 1/8" angle iron framed properly supported.
2. All machinery guards covering the ends of motor or equipment shafts shall have openings for the insertion of a tachometer.

1.10 DRIP PANS

A. The respective mechanical contractor shall provide 20 oz. copper all soldered reinforced pans with 2" high lips under all heating, domestic water piping, soil and waste piping which runs over electric switchboards, mounting boards, motors or electric motor starters. Each drip pan shall have a copper drain piped to discharge where shown on the drawings, of if not shown, to discharge to the nearest available open drain or floor where directed by the Owner's Representative. All piping shall be copper 1-1/2" minimum in diameter.

1.11 CONCEALMENT OF UNSIGHTLY INSTALLATIONS

A. Piping and conduit work is to be run concealed in all occupied areas, in partitions, construction and pipe spaces. Obtain exact dimensions locations of partitions, use special care to see that no joints, fittings, piping or conduit will be exposed except as shown or specified. In the event of any unsightly exposed piping or conduit work or unsightly partitions resulting, the Contractor shall rebuild, and re-run lines at his own expense. When approved by the Owner's Representative all exposed conduit shall be installed in wiremold.

1.12 SUPPORTS FROM OVERHEAD CONSTRUCTION

A. Where overhead equipment does not permit fastening of supports for equipment, furnish at no additional cost to the Owner, additional framing, supplementary steel, etc., as required, subject to approval by the Owner's Representative. Specific types of hangers and supports which are required in certain areas are to be installed as indicated on the drawings.

1.13 ESCUTCHEONS

A. Where exposed un-insulated mechanical piping or conduits pass through floors, ceilings or walls of finished rooms, apply, approved hinged escutcheon of sufficient outside diameter to cover the pipe sleeve.
   1. Where exposed insulated pipes pass through walls, floors, or ceilings of finished rooms, provide escutcheons fastened to the sleeves.
   2. Finish shall be stainless steel in toilets, janitor’s closet and similar “wet areas”. Submit samples.

1.14 FLASHINGS

A. Cap Flashing:
   1. Unless noted othewise on drawings all cap flashings for Plumbing, Electrical, and Mechcanical work shall be provided by the respective Plumbing, Mechcanical, and Electrical Contractor, except where specifically indicated or specified to be provided by the General Construction Contractor.
      a. Unless noted othewise on drawings cap flashings for all contracts shall conform to Section 07600 Flashing and Sheetmetal and shall be a minimum 16 oz.. lead coated copper. Provide a minimum 4" lap extending over the base flashing.

B. Base Flashing:
   1. All base flashings and pitch pockets for all contracts to be installed in new roofing system shall be provided by the Construction Contractor.
      a. All base flashing and pitch pockets for equipment installed on existing roof systems shall be furnished and installed by the Construction Contractor. Work shall be compatible to existing roofing system and performed by installers acceptable to the roofing manufacturer so as not to void any existing roofing warranties. Prior to starting work on existing roof systems notify Owner's Representative and roofing manufacturer.
      b. Unless noted othewise on drawings all base flashing shall be a minimum 12" above roof membrane.

1.15 WATERPROOFING

A. Where any work pierced waterproofing, including waterproof concrete, the method of installation shall be approved by Owner's Representative before work is done. Each Contractor shall furnish all necessary sleeves, caulking and flashing required making openings absolutely watertight. (See Cutting and Patching, Section 00 1731.)

1.16 SALVAGEABLE MATERIALS:

A. Refer to Section 01 7000 - Execution

1.17 CONSERVATION:

A. General: It is a requirement for each Prime Contractor's supervision and administration of the work, that construction operations be carried out with the maximum possible consideration given to conservation of energy, water and materials.

1.18 MATERIALS AND WORKMANSHIP

A. All material, apparatus and accessories shall be new and of the best quality of their respective kind.
   1. Work and materials shall conform to the latest applicable requirements of the New York State Building Code including Reference Standards or National Board of Fire Underwriters and Local Municipal codes, where applicable.
   2. All labor shall be performed in a first-class workmanlike manner, and adequate supervision must be provided to insure against neglect or faulty installations of any part of the systems during the progress of the work.

3. Any inferior material and/or workmanship shall be removed at once, when directed by the Owner's Representative and replaced with material and workmanship in accordance with the true intent and meaning of the drawings and specifications, at no additional cost to the Owner.
4. If material or equipment is installed before it is approved, as to manufacture and shop drawings, the Contractor shall be liable for the removal and replacement at no extra charge, if in the opinion of the Owner's Representative the material or equipment does not meet the intent of the drawings and specifications.
5. If after installation (with or without prior approval) operation of any equipment proves to be unsatisfactory by reasons of defects, workmanship, error or omissions, the Owner's Representative reserves the right to operate equipment until it can be removed from service for correction or replacement by the Contractor. The Contractor shall pay for the repair of all damage to work of other Prime Contractor's caused by this defective equipment and its correction or replacement.
6. No advertising matter exclusive of nameplates containing required data shall appear on any equipment without the written consent of the Owner's Representative. The equipment furnished under this specification shall be essentially the standard product of a manufacturer regularly engaged in the manufacture of such equipment. Where two or more units of the same class of equipment are required, the units shall be products of a single manufacturer; however, the component parts of the equipment need not be products of the same manufacturer.

1.19 SELECTIVE REMOVAL OF EXISTING PLUMBING, HEATING, ELECTRICAL AND RELATED WORK

A. All selective removal work shall be in accordance with the time schedule as specified herein.
1. All plumbing, mechanical and electrical removals shall be performed as required to complete the work as intended.
2. Remove all plumbing, heating and electrical apparatus, equipment, specialties, drains, controls, hangers, bases supports, piping, pneumatic tubing, conduit, panels, switches, wiring, plumbing accessories and electrical fixtures, etc., that are not incorporated in the new layout or required.
3. Where removal is indicated, or implied, or not incorporated in the new layout, the item itself is to be removed completely together with all connecting conduits, specialties, supports, controls, etc. Connecting conduits are to be removed back to the mains and panels where they are to be capped or disconnected. All abandoned open ends shall be sealed and capped or disconnected. This includes all heating, electric, water, gas, etc. Patching and finishing of all surfaces to match existing shall be performed by the Contractor doing the removal. (See Cutting and Patching Section 01700)
4. Where existing conduit, etc., enter inaccessible trenches, tunnels, shafts, walls, and ceilings, inside of the existing building, they shall be cut back at least 2" into such inaccessible spaces and shall be suitably capped and sealed by the Contractor.
5. Each Contractor shall exercise all normal caution to prevent unnecessary cutting and damage to the existing building. Any excessive damage, as determined by the Owner's Representative shall be repaired and paid for by the Contractor causing the damage.

1.20 ELIMINATION OF NOISE AND VIBRATION

A. All equipment and accessories shall operate without objectionable noise or vibration.
1. Should operation of any one or more of the systems produce noise or vibration which is, in the opinion of the Owner's Representative, objectionable, the Contractor shall, at his own expense, make changes in equipment and do all work necessary to eliminate the objectionable noise or vibration.
2. All work shall operate under all conditions of load without any sound or vibration which, in the opinion of the Owner's Representative, is objectionable. In the case of moving machinery, sound or vibration noticeable outside the room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Owner's Representative shall be corrected in an approved manner by the Contractor at his expense.

a. Provide vibration isolators on all moving machinery.

1.21 GENERAL LABELING

A. All mechanical and electrical equipment such as unit ventilators, heating and ventilating units, exhaust fans, etc., shall have appropriate descriptive labels, identification tags and nameplates, furnished and installed under the respective control under which the corresponding item is provided, and shall be properly placed and permanently secured to (or adjacent to) the item being installed.
   1. Submit complete schedules, listings, and descriptive data, together with samples for checking and approval before purchasing.
   2. Refer to respective M/E specifications for additional requirements.

1.22 IDENTIFICATION OF PIPING

A. Each Contractor shall provide on all new exposed, insulated and uninsulated piping, semi-rigid, wrap-around plastic identification markers.
   1. Each marker background is to be appropriately color-coded with a clearly printed legend to identify the contents of the pipe conformance with the Scheme for the Identification of Piping Systems (ASA A13.1-1956). Direction of flow arrows is to be included on each marker.
   2. Exposed locations for the pipe markers to be as follows:
      a. Adjacent to each valve.
         a) At each branch and riser take-off.
         b) At each pipe passage through wall, floor and ceiling construction.
         c) On all horizontal pipe runs - marked every 15 feet.
         d) At each inlet and outlet of coils, pumps, etc.
   3. Refer to respective M/E specifications for additional requirements.

1.23 PAINTING

A. All apparatus, cabinets, etc., furnished under the Mechanical and Electrical Sections of the specifications, shall be provided with a priming coat, and enamel finish. All patched surfaces and surfaces where removals have occurred (by each Contractor) shall receive a prime coat and a finish coat to match adjacent surfaces acceptable to the Owner's Representative unless noted otherwise.
   1. All finish painting of new insulated and uninsulated piping, new duct work, apparatus, and appurtenances, will be performed by each contractor, unless noted otherwise.
   2. All concealed supports and ironwork not otherwise protected against corrosion shall be given two (2) coats of bituminous base paint.

1.24 TEMPLATES:

A. Each contractor shall prepare templates showing all dimensions and shall furnish all anchor bolts and sleeves required for all equipment,, boilers, and transformers, etc., and submit to Contractor who requires this information.

1.25 EQUIPMENT BASES

A. Each contractor shall submit for approval of the Fuller and D'Angelo, P.C., detail drawings of all equipment foundations and shall furnish all templates for his foundation.
   1. Unless otherwise indicated Construction Contractor will furnish and install their equipment bases. It is the responsibility of each Contractor to place any templates and anchor bolts and to supervise the construction of the equipment bases regardless of who installs the bases.
      a. Concrete equipment bases for shall be minimum 3,000 psi test strength at 28 days . Provide minimum 6/6 x 10/10 welded wire mesh.

1.26 MOTORS

A. Each Contractor shall furnish and install the electric motors required for the motor-driven equipment supplied under his contract. The motors shall be of sufficient size for the duty to be performed, and shall not exceed their full rated load when the driven equipment is operating at required capacity under the

most severe conditions likely to be encountered. The speed and horsepower for each motor are given in the schedule on the drawings, or are specified.

1. All motors shall be suitable for operating on alternating current, sixty (60) cycle frequency. Motors 1/2 horsepower and smaller shall be wound for single-phase, 60 cycle, 120 volt current. Motors exceeding 1/2 horsepower shall be designed for operation on three phase, 60 cycle, voltage indicated on the Electrical drawings or specifications current.
    a. Fractional horsepower motors shall be of the sealed prelubricated ball bearing type.
        a) All motors shall be approved by the Underwriters Laboratories, Inc., for the service and location intended.
        b) All motors shall be equipped with ball bearings unless specified otherwise in other sections of these specifications.
        c) Motors for single-phase operation shall be of the capacitor type.

1.27 WIRING

A. The wiring of prewired equipment or apparatus is specified under the corresponding sections of the Specifications. The Electrical volt systems design as indicated on the Electrical Drawings and Specifications.

B. The Electrical Contractor will perform all Power wiring; however, each Contractor shall furnish all magnetic starters and automatic controls, suitable for the equipment furnished by the Contractor. Motor starters shall be installed by the Electrical Contractor.

C. Each Contractor shall prepare wiring diagrams and submit same for approval Submit in electronic PDF format.Approved copies with any additional instructions are to be given to the Electrical Contractor.
    1. All prewired and job wired control panels for motors shall be provided with approved high interrupting capacity circuit breakers.
    2. All electrical wiring for equipment where exposed to the weather (factory or field installed) shall be installed in weathertight conduits and shall be U.L. approved.

1.28 CONTROL WIRING

A. Control wiring is required wiring, conduit, relays, contractors, electro-mechanical, hydraulic activators and solid state regulating devices either low or line voltage, to the controlled device that is regulated by the controller and necessary for the operation, controlling, sequencing etc. of the equipment or system. Control wiring shall be furnished and installed by each contractor furnishing and installing such equipment or systems.
    1. Power wiring to equipment, including wiring and installation of magnetic starters and disconnect switches, where required, shall be the responsibility of the Electrical Contractor. The Electrical Contractor shall furnish and install all disconnect switches, where required, and install all magnetic starters. All magnetic starters shall be furnished by each contractor furnishing the equipment or systems.
    2. EachContractor shall supervise the wiring of all equipment included under his Contract.

1.29 MOTOR STARTERS

A. Except where specified to be motor or pedestal mounted as part of a prewired control panel furnished with the equipment they serve, all magnetic starters shall be provided by each Contractor. Magnetic starters, with thermal and under voltage protection, suitable for the voltages indicated, shall have a heater in each phase and reset button on the cover.
    1. Motors 1/2 HP and larger shall have Allen Bradley, Emerson Phase Guard or approved substitute phase failure relays suitable for the voltages indicated, included in the starter enclosure. Refer to specific section of specifications for special starters.

B. Motors over 1 HP shall be provided with variable frequency drive. (VFD), unless shown otherwise

C. Where the installation of phase failure non-reversing relays are required, these shall, wherever possible, be wired and installed at the equipment manufacturer's factory panel mounted equipment in connection

with refrigeration equipment and temperature controls. Starters shall be Allen Bradley, Square D or approved equal.

1.30 UNDERWRITERS' LABORATORIES CERTIFICATION

A. All mechanical and electrical equipment shall bear the UL label of approval where such inspection service is furnished for the particular type of equipment.

1.31 LOCATIONS AND MEASUREMENTS

A. The locations of fixtures, appliances, conduits, etc., are specified and shown on the plans as accurately as possible, but in all cases, they are to be adjusted to the surrounding conditions. Contractor must take all measurements at the building, and should the space allotted for any appliance be inadequate, it shall be the Contractor's responsibility to immediately notify in writing, and shall he fail to do so, he must bear the expense necessary to correct the conditions. All work shall be coordinated with the work of other trades.

1.32 GROUNDING

A. Standards set forth by the latest edition of the National Electric Code, relative to the grounding of system and equipment, shall be followed together with the rules and regulations of the Utility Company. All non-current carrying metal parts shall be solidly grounded. All motor frames that are not clamped to supply conduits shall be grounded by suitable wire and ground clamp.

1. The identified neutral wire or white wire of the interior wiring system shall be permanently grounded to the water services. The grounded wire shall be connected to the supply side of the main service switch and mechanically connected to an approved ground clamp and securely bonded to the water service at the point of entry. The ground connection shall be made on the supply side of the first main control valve. The conductors shall be protected from mechanical injury by rigid steel conduit to which the conductors shall be securely bonded in each length of connection. Conduit system shall be securely grounded to the above described ground of wiring system.
2. Ground connections to water mains shall be made to non-current carrying metal parts of distribution panels, instrument cases, and instrument transformer cases.

1.33 FIRESTOPPING:

A. All openings thru walls, floors, shafts, etc. shall be fire stopped with approved material to maintain rating. See Section 07 8400 - Firestopping.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

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 SECTION INCLUDES

A. Substantial Completion.

B. Final Completion.

C. Project record documents.

D. Operation and maintenance data.

E. Warranties

1.3 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions: Warranty and Correction of work.

B. Section 01 3000 - Administrative Requirements: Submittals procedures.

C. Section 01 7000 - Execution: Progress and Final cleaning.

D. Section 01 7900 - Demonstration and Training.

E. Section 01 9113 - General Commissioning Requirements.

F. Individual Product Sections: Specific requirements for operation and maintenance data.

G. Individual Product Sections: Warranties required for specific products or Work.

1.4 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion:

1. Prepare a list of items to be completed and corrected, the value of items on the list, and reasons why the Work is not complete.
2. Advise Architect and Construction Manager of pending insurance changeover requirements.
3. Obtain and submit releases permitting Architect and Construction Manager unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

B. Prior to issuance of the Certificate of Substantial Completion, submit, in writing, a request to the Architect and Construction Manager to perform site inspection for the purpose of preparing a "punch list".

C. On receipt of request the Architect and Construction Manager will schedule and prepare a punch list.

D. Certificate of Substantial Completion will be issued **only after completion of all punch list items, including photos of corrected items,** or Construction Manager will notify the each Prime Contractor of items, either punch list or additional items identified by Architect, **that must be completed or corrected before a certificate will be issued.** After completion of **all punch list items** submit the following:

1. Application for Payment showing 100 percent completion for portion of the Work claimed as substantially completed.
2. Manufacturer's Warranties/guarantees.
3. Contractor's Warranty Two (2) years minimum and extended warranties.
4. Maintenance agreements, if any.
5. Manifest for disposal of Hazardous Material.
6. Manifest for disposal of material.
7. Test/adjust/balance reports and records.
8. Maintenance Manuals and Instructions Manuals
9. Signed Receipt by Construction Manager of spare parts and attic stock, if any.

10. Start-up performance reports.
11. Changeover information related to Owner's occupancy, use, and maintenance.
12. Video Training Sessions.
13. Advice on shifting insurance coverage.
14. All third party inspections including concrete, steel, rebar, manufactuers field inspection, etc.
15. List of incomplete Work, recognized as exceptions to Architect's and Construction Manager's "punch list".
16. Removal of temporary facilities and services.
17. Removal of surplus materials, rubbish and similar elements.
18. As Built Drawings.
19. Project Record Documents.
20. Fully executed Certificate of Substantial Completion. (AIA G704 by Architect).
21. Asbestos manifest, if any.
22. Underwriters Certificate or authorized third party Certificate.
23. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

E. Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
   1. If necessary re-inspection will be repeated and the contractor shall pay for all additional inspections.
   2. Results of completed inspection will form the basis of requirements for Final Completion.
   3. The maximum payment for Substantial Completion shall 100% of contract amount, **less 5% retainange.** The retainage will be paid when all Final Completion items are submitted and approved.

1.5 FINAL COMPLETION AND PAYMENT

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify each Prime Contractor of unfulfilled requirements. Architect and Construction Manager will not process a final Certificate for Payment until after the inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
      a. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
      b. At the completion of each “punch list” item the each Prime Contractor shall photograph each item and submit them to Construction Manager.

B. Following Final Inspection and acceptance of work submit the following: (As applicable to each Prime Contractor)
   1. Submit a final Application for Payment according to Division 1 Section 01 2000 - Price and Payment Procedures.
   2. Architect's punch list certifying all punch list items have been completed, with photograph of each item, signed off by the Construction Manager and each Prime Contractor**.**
   3. Update final statement, accounting for final changes to the Contract Sum.
   4. Consent of Surety to Final Payment, AIA Document G707
   5. Final Liquidated Damages settlement statement.
   6. Contractor's Affidavit of Release of Liens (AIA G706A).
   7. Contractors Affidavit of Payment of Debts and Claims (AIA G706)
   8. Contractor's Certification of Payment of Prevailing Wage Rates.

9. Contractor's Certification of Compliance that products comply with VOC requirements stated in Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
10. Contractor's Certified Statement certifying that no asbestos containing material was incorporated into the project.
11. DOL Final Completion Form. (PW 200).

1.6 SUBMITTALS

A. Each Contractor shall submit all documentation identified in this section within thirty (30) working days from the time the Contractor submits the list of items to be corrected, in addition to other rights of the Owner set forth elsewhere in the Contract Documents, to include but not limited to withholding of final payment. If the documentation has not been submitted within Thirty (30) day period, the Owner's Representative will obtain such through whatever means necessary. The Contractor shall solely be responsible for all expenses incurred by the Owner, provided the Owner has advised the Contractor of this action seven (7) days prior to the culmination date by written notice.

B. Project Record Documents: Submit documents to Architect with claim for final Application for Payment. Refer to Section 01 1000 Summary of Work for addition information.

C. Operation and Maintenance Data:
1. Refer to individual sections for additional requirements.
2. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Construction Manager and Architect will review draft and return one copy with comments.
3. For equipment, or component parts of equipment put into service during construction and operated by Edgemont School District, submit completed documents within ten days after acceptance.
4. Submit one copy of completed documents 10 days prior to final inspection. This copy will be reviewed and returned after final inspection with Owner's Representative and Architect comments. Revise content of all document sets as required prior to final submission.
5. Submit two sets of revised final documents in final form within 10 days after final inspection.

D. Warranties.
1. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
2. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.
7. O&M Manuals.

B. Ensure entries are complete and accurate, enabling future reference by Owner's Representative.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.
1. Review with Owner's Representative with each application for payment.
2. Owner's Representative shall verify record mark-up are up to date.

3. Failure to maintain mark up will be cause for rejecting the application.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

G. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and approved Shop Drawings at the project site.

H. Each Contractor is responsible for marking up Sections that contain its own Work and for submitting the complete set of record Specifications as specified.

I. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
   1. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   2. Accurately record information in an understandable drawing technique.
   3. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

J. Content: Types of items requiring marking include, but are not limited to, the following:
   1. Dimensional changes to Drawings.
   2. Revisions to details shown on Drawings.
   3. Locations and depths of underground utilities.
   4. Revisions to routing of piping and conduits.
   5. Revisions to electrical circuitry.
   6. Actual equipment locations.
   7. Duct size and routing.
   8. Locations of concealed internal utilities.
   9. Changes made by Change Order or Construction Change Directive.
   10. Changes made following Owner's Representative and Architect 's written orders.
   11. Details not on the original Contract Drawings.
   12. Field records for variable and concealed conditions.
   13. Record information on the Work that is shown only schematically.

K. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

L. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

M. Mark important additional information that was either shown schematically or omitted from original Drawings.

N. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

O. **Provide ALL final record documents on flash drive in PDF-A Format.**

3.2 FORMAT

A. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Contractor shall certify and sign.

B. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record PDF Drawings: Organize PDF information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each PDF file.

D. Identify Record Drawing as follows:

1. Project name.
    a. Date.
    b. Designation "PROJECT RECORD DRAWINGS."
    c. Name of Owner, Owner's Representative, Architect , Consultants, and Construction Manager.
    d. Name of Contractor.
    e. Contractor shall certify and sign each drawings or attached TOC as follows:
        a) "We the undersigned certify that we have reviewed and coordinated the As-Built Drawings and they are in conformance to the plans, specifications, applicable codes and provisions of the Contract Documents. To the best of our knowledge all items reflected on the As-Built Drawings are a true representation of the site and building conditions".

3.3 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.4 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.5 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:

1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

1. Include HVAC outdoor and exhaust air damper calibration strategy.
    a. Include provisions which ensure that full closure of dampers can be achieved.
2. Include Carbon Dioxide Monitoring Protocol.
3. Include Carbon Monoxide Monitoring Protocol.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide contractors's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.6 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Edgemont School District's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Owner's Representative, Fuller and D'Angelo, P.C., Consultants, Construction Manager, Contractor, and Subcontractors with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Operation and maintenance data.
      c. Field quality control data.
      d. Photocopies of warranties and bonds.

K. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
   1. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3.7 WARRANTIES

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Edgemont School District's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

CHECKLIST FOR PROJECT CLOSEOUT AND PROCESSING OF FINAL PAYMENT

SUBMIT CHECKLIST WITH COSEOUT DOCUMENTS

Project: HVAC Upgrades And Cafeteria Renovations

Owner: Edgemont School District

Architect Project #: 21434.01

CLOSE-OUT SUBMITTALS: (As Applicable. Include this checklist with submittal)

SUBSTAINTIAL COMPLETION

[ ] UL Certification or equivalent.

[ ] Three (3) Ring Binder Brochures of Operation And Maintenance Manuals For All Equipment Installed on The Project including the following:

- [ ] Typed or Printed Instructions Covering The Care And Operations of Equipment And Systems Furnished And Installed.
- [ ] Start-up Performance Reports
- [ ] Test/Balancing Reports.
- [ ] Final Survey
- [ ] Manufacturers Instruction Books, Diagrams, Spare Parts Lists Covering All Equipment.
- [ ] Instruction of Owner's Representative In Care And Maintenance of New Equipment.
- [ ] All Approved Shop Drawings and Submittals.
- [ ] Third Party Inspections Reports.
- [ ] Field Reports Executed by each Prime Contractor.
- [ ] Video Training Sessions.
- [ ] Surveys and survey logs.
- [ ] Certificates of Compliance And Inspection. (Where Applicable Electric, Elevator, Etc.)

[ ] Spare Parts, O&M and Maintenance Materials. (Receipt Signed By Field Superintendent)

[ ] Evidence of Compliance With Requirements Of Governing Authorities (Certificates Of Inspection Electrical).

- [ ] Certificates of Insurance For Products And Completed Operations. .
- [ ] Fully Executed Certificate of Substantial Completion: AIA G704 (Issued by Architect).
- [ ] Construction Manager's Written Two-Year Warranty And Extended Warranties (If Any Required).
- [ ] Manufacturer’s Warranty/Guaranties
- [ ] Manifest for Disposal of Hazardous Material.
- [ ] Manifest for Disposal of Material.
- [ ] Architect's Punch List Items, **including photographs,** certifying all Punch List have been completed with sign-off by Construction Manager and Contractor.
- [ ] Project Record Documents.
- [ ] Approved As-Built Drawings. (Printed Copy and PDF Format with corrections if any)

[ ] **All files listed above shall be submitted on USB flash drive**

_____ Date _____

(Authorized signing officer, Title)

FINAL COMPLETION

[ ] Affidavit of Payment of Debts And Claims: AIA G706.

[ ] Affidavit of Final Release of Liens - AIA G706a for all with Lien Right Against The Owner's Property.

[ ] Notarized Statement That Only Non-Asbestos Materials Were Installed On This Project.

[ ] Consent Of Surety To Final Payment AIA G707.

[ ] Certification of Payment of Prevailing Wage Rates.

[ ] Contractor's Certification of Compliance that products comply with VOC requirements stated in Section 01 6116.

[ ] DOL PW 200 Form.

_____ Date _____

(Authorized signing officer, Title)

Final payment will not be processed until all items indicated are received and approved in accordance with Section 01 7800 - Closeout Submittals by the Construction Manager .

END OF SECTION

SECTION 01 7900
DEMONSTRATION AND TRAINING

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. Demonstration of products and systems to be commissioned where indicated in specific specification sections.

B. Training of Edgemont School District personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. Mechanical systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Items specified in individual product Sections.

C. Training of Edgemont School District personnel in care, cleaning, maintenance, and repair is required for:
   1. Items specified in individual product Sections.

1.3 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Section 01 9113 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Make commissioning submittals on time schedule specified by Commissioning Authority.
   3. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Draft Training Plans: Edgemont School District will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Consruction Manager for transmittal to .
   2. Submit to Commissioning Authority for review and inclusion in overall training plan.
   3. Submit not less than four weeks prior to start of training.
   4. Revise and resubmit until acceptable.
   5. Provide an overall schedule showing all training sessions.
   6. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of four attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Video Recordings: Submit digital video recording of each demonstration and training session for Edgemont School District's subsequent use.
   1. Format: DVD Disc.
   2. Label each disc and container with session identification and date.

1.5 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Consruction Manager.

B. Demonstrations conducted during Functional Testing need not be repeated unless Edgemont School District personnel training is specified.

C. Demonstration may be combined with Edgemont School District personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.

B. Conduct training on-site unless otherwise indicated.

C. Construction Manager will provide classroom and seating at no cost to the Contractor.

D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

E. Provide training in minimum of two (2) - two hour segments.

F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.

G. Training schedule will be subject to availability of Edgemont School District's personnel to be trained; re-schedule training sessions as required by Edgemont School District; once schedule has been approved

by Edgemont School District failure to conduct sessions according to schedule will be cause for Edgemont School District to charge the Contractor for personnel "show-up" time.

H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

I. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by the Contractor
   11. Review spare parts suppliers and sources and procurement procedures.

J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within five days.

END OF SECTION

SECTION 019113 – COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1) Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2) Verify and document proper performance of equipment and systems.
3) Verify that O&M documentation left on site is complete.
4) Verify that the Owner's operating personnel are adequately trained.

B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

C. Abbreviations. The following are common abbreviations used in this Specification and in the Commissioning Plan to be developed. Definitions are found in Section 1.6.

A/E-	Architect and design engineers	FT-	Functional performance test
CA-	Commissioning authority	GC-	General contractor (prime)
CC	Controls contractor	MC-	Mechanical contractor
CM-	Construction Manager (the owner's representative)	PC-	Prefunctional checklist
Cx-	Commissioning	PM-	Project manager (of the Owner)
Cx Plan-	Commissioning Plan document	Subs-	Subcontractors to General
EC-	Electrical contractor	TAB-	Test and balance contractor

1.2 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning authority (CA), the Project Manager (PM), , the General Contractor (GC or Contractor), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management. The CA directs and coordinates the commissioning activities.

C. Scheduling. The CA will work with the Contractor according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the Contractor for scheduling commissioning activities. The Contractor will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

The Contractor will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The *Commissioning Plan—Construction Phase* shall provide a format for this schedule. As construction progresses more detailed schedules are developed by the CA. The Commissioning Plan shall also provide a format for detailed schedules.

1.3 COMMISSIONING PROCESS

A. Commissioning Specifications. The commissioning specifications shall be provided as part of the bid documents and is binding on the Contractor. The commissioning plan provides guidance in the execution of the commissioning process. The CA shall present a preliminary *Commissioning Plan* for the Construction Phase at the pre-construction or initial commissioning coordination meeting. Just after the initial commissioning scoping meeting the CA will update the plan which is then considered the "final" plan, though it will continue to evolve and expand as the project progresses. The *Specifications* will take precedence over the *Commissioning Plan*.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout construction, scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures.
4. The CA works with the Subs in developing startup plans and startup documentation formats, including providing the Subs with prefunctional checklists to be completed, during the startup process.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing.

6. The Subs, under their own direction, execute and document the prefunctional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing start-up of selected equipment.
7. The CA develops specific equipment and system functional performance test procedures. The Subs review the procedures.
8. The procedures are executed by the Subs, under the direction of, and documented by, the CA.
9. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
10. The CA reviews the O&M documentation for completeness.
11. Commissioning is completed before Substantial Completion.
12. The CA reviews, pre-approves and coordinates the training provided by the Subs and verifies that is was completed.
13. Deferred testing is conducted, as specified or required.

1.4 RELATED WORK

A. Specific commissioning requirements shall be given in and/or amended to the following sections of these specifications. All of the following sections apply to the Work of this section.

15900 Instrumentation and Control for HVAC Lists special requirements and alerts the controls contractor of the special requirements of the control contractor and control system.

15950 Testing, Adjusting and Balancing (TAB). Alerts the TAB of Cx responsibilities.

1.5 RESPONSIBILITIES

A. Commissioning Authority (CA)

The CA (if not also the designer) is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving of non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CA.

Construction and Acceptance Phase

1. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the Contractor, ensure that commissioning activities are being scheduled into the master schedule.
3. Develop and revise, as necessary, the *Commissioning Plan—Construction Phase.*
4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.

5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review and approve normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute prefunctional tests and checklists.
9. Develop an enhanced start-up and initial systems checkout plan with Subs.
10. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
11. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owners project manager of any deficiencies in results or procedures.
12. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
13. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot checking.
14. Approve systems startup by reviewing start-up reports and by selected site observation.
15. Review TAB execution plan.
16. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
17. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
18. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing. Submit to the A/E and PM for review, and for approval if required.
19. Analyze any functional performance trend logs and monitoring data to verify performance.
20. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved. Perform actual functional testing without contractors on any equipment so specified in Section 230800
21. Maintain a master deficiency and resolution log and a separate testing record. Provide the A/E and PM with written progress reports and test results with recommended actions.
22. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
23. Oversee and approve the training of the Owner's operating personnel.
24. Compile and maintain a commissioning record and building systems book(s).
25. Review and approve the preparation of the O&M manuals.
26. Provide a final commissioning report (as described in this section).

Warranty Period

1. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
2. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the

original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

B. Contractor

Construction and Acceptance Phase

1. Facilitate the coordination of the commissioning work by the CA, and with the Contractor and CA ensure that commissioning activities are being scheduled into the master schedule.
2. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CA.
3. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
4. Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
5. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Cx process.
6. Coordinate the training of owner personnel.
7. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

Warranty Period

1. Ensure that Subs execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Ensure that Subs correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

C. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone datalogging equipment that may be used by the CA.
4. Through the contractors they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project's scope and budget.
5. Provide information requested by CA regarding equipment sequence of operation and testing procedures.
6. Review test procedures for equipment installed by factory representatives.

1.6 DEFINITIONS

Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

Approval - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

Architect / Engineer (A/E) - the architect and engineering consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

Commissioning authority (CA) - an independent agent, not otherwise associated with the A/E team members or the Contractor. The CA directs and coordinates the day-to-day commissioning activities

Commissioning Plan - an overall plan, developed after bidding that provides the structure, schedule and coordination planning for the commissioning process.

Control system - the central building energy management control system (or DDC System).

Datalogging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

Deferred Functional Tests - FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

Design Intent - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.

Factory Testing - testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.

Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.

Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Non-Compliance - see Deficiency.

Non-Conformance - see Deficiency.

Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

Owner-Contracted Tests - tests paid for by the Owner outside the GC's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.

Prefunctional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

Project Manager (PM) - the contracting and managing authority for the owner over the design and/or construction of the project, a staff position.

Sampling. - functionally testing only a fraction of the total number of identical or near identical pieces of equipment. Refer to Section 019113, Part 3.6, F for details.

Seasonal Performance Tests - FT that are deferred until the system(s) will experience conditions closer to their design conditions.

Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

Startup - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.

Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CA.

Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Division 23 Specifications.(

Trending - monitoring using the building control system.

Vendor - supplier of equipment.

Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.7 SYSTEMS TO BE COMMISSIONED

A. All equipment depicted in mechanical equipment schedules and controls riser diagrams will be commissioned in this project.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CA.

C. Datalogging equipment and software required to test equipment will be provided by the CA, but shall not become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications.* All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

E. Refer to Section 019113, Part 3.6 E for details regarding equipment that may be required to simulate required test conditions.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting. Within 60 days of commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CA. Information gathered from this meeting will allow the CA to revise the *Commissioning Plan* to its "final" version, which will also be distributed to all parties.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CA will plan these meetings and will minimize

unnecessary time being spent by Subs. For large projects, these meetings may be held monthly, until the final 3 months of construction when they may be held as frequently as one per week.

3.2 REPORTING

A. The CA will provide regular reports to the PM, depending on the management structure, with increasing frequency as construction and commissioning progresses. Standard forms are provided and referenced in the *Commissioning Plan.*

B. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. A final summary report (about four to six pages, not including backup documentation) by the CA will be provided to the PM, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Prefunctional checklists, functional tests and monitoring reports will not be part of the final report, but will be stored in the Commissioning Record in the O&M manuals.

3.3 SUBMITTALS

A. The CA will provide appropriate contractors with a specific request for the type of submittal documentation the CA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning authority. All documentation requested by the CA will be included by the Subs in their O&M manual contributions.

B. The Commissioning authority will review and approve submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The Commissioning authority will notify the, PM or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resubmission.

C. The CA may request additional design narrative from the Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

D. These submittals to the CA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CA will review and approve them.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.7, Systems to be Commissioned. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified PCs and startup.

B. General. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The CA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements in Section 230800.

1. The CA develops, if necessary, the representative prefunctional checklists based on the examples provided in this Section 019113. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution. The checklists will be provided as part of the *Commissioning Plan – Construction Phase*.
2. These checklists and tests are provided by the CA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution.
3. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.

   The full start-up plan could consist of something as simple as:
   a. The CA's prefunctional checklists.
   b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
   c. The manufacturer's normally used field checkout sheets.

4. The subcontractor submits the full startup plan to the CA for review and approval.
5. The CA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.
6. The full start-up procedures and the approval form may be provided to the A/E or PM for review and approval, depending on management protocol.

D. Sensor and Actuator Calibration.

All field-installed temperature, relative humidity, CO_2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner before-hand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed *in* the unit at the factory with calibration certification provided need not be field calibrated.

All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

Sensor Calibration Methods

All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.

Sensors Without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

Sensors With Transmitters--Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA or 0 VDC is read by the ammeter/voltmeter. Repeat for the maximum temperature matching 20 mA or 10VDC to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

Critical Applications. For critical applications (process, manufacturing, etc.) more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

Tolerances, Standard Applications

Sensor	Required Tolerance (+/-)	Sensor	Required Tolerance (+/-)
Cooling coil, chilled and condenser water temps	0.4F	Flow rates, water	4% of design
AHU wet bulb or dew point	2.0F	Relative humidity	2% of design
Hot water coil and boiler water temp	1.0F		

Outside air, space air, duct air temps	0.4F
CO_2 monitor	0.1 % pts
Pressures, air, water and gas	3% of design

Valve and Damper Stroke Setup and Check
EMS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.
Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions.
Closure for heating coil valves (NO): Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 20°F below room temperature. Observe the valve close. Restore to normal.

Closure for cooling coil valves (NC): Set cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 20°F below room temperature. Observe valve open. Restore to normal.

E. Execution of Prefunctional Checklists and Startup.

1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the, Contractor and CA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.
2. The CA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the A/E). In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.
3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CA shall observe a sampling of the prefunctional and start-up procedures. The sampling procedures shall be identified in the commissioning plan.
4. The Subs and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
5. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The Subs shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CA within two days of test completion.
2. The CA reviews the report and submits either a non-compliance report or an approval form to the Sub or PM. The CA shall work with the Subs and vendors to correct and retest

deficiencies or uncompleted items. The CA will involve the Contractor and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system to the Contractor using a standard form.

3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in backcharges to the responsible party. Refer to Part 3.7 herein for details.

3.5 PHASED COMMISSIONING

A. Phasing will be planned and scheduled, if necessary, in a coordination meeting of the CA, , mechanical, TAB and controls and the Contractor. Results will be added to the master and commissioning schedule.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in Section 019113, Part 1.7. The specific equipment and modes to be tested are found in the Division 23 Sections

C. The parties responsible to execute each test are listed with each test in Section 230800

D. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in the Division 23 Sections .

E. Development of Test Procedures. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements in Division 23 , the CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CA may submit the tests to the A/E for review, if requested.

The CA shall review owner-contracted, factory testing or required owner acceptance tests which the CA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the *Specifications*. Redundancy of testing shall be minimized.

The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

The test procedure forms developed by the CA shall include (but not be limited to) the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number, and reference to unique prefunctional checklist and start-up documentation ID numbers for the piece of equipment
4. Date
5. Project name
6. Participating parties
7. A copy of the specification section describing the test requirements
8. A copy of the specific sequence of operations or other specified parameters being verified
9. Formulas used in any calculations
10. Required pre-test field measurements
11. Instructions for setting up the test.
12. Special cautions, alarm limits, etc.
13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
14. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
15. A section for comments
16. Signatures and date block for the CA

F. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers. Division 23 sections specify which methods shall be used for each test. The CA may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the A/E. This may require a change order and adjustment in charge to the Owner. The CA will determine which method is most appropriate for tests that do not have a method specified.
2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the

value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.

4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.
7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. It is noted that no sampling by Subs is allowed in prefunctional checklist execution.

   A common sampling strategy referenced in the *Specifications* as the "xx% Sampling—yy% Failure Rule" is defined by the following example.

   xx = the percent of the group of identical equipment to be included in each sample.
   yy = the percent of the sample that if failing, will require another sample to be tested.

   The example below describes a 20% Sampling—10% Failure Rule.

   a. Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample."
   b. If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
   c. If 10% of the units in the second sample fail, test all remaining units in the whole group.
   d. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

G. Coordination and Scheduling. The Subs shall provide sufficient notice to the CA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems.

The CA will schedule functional tests through the, Contractor. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

H. Test Equipment. Refer to Section 019113, Part 2.1 for test equipment requirements.

3.7 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the Contractor for review and approval. The CA will include the filled out forms in the O&M manuals.

B. Non-Conformance.

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the Contractor on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the PM.
4. As tests progress and a deficiency is identified, the CA discusses the issue with the executing contractor.
    a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
        1) The CA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CA submits the non-compliance reports to the Contractor for signature, if required. A copy is provided to the Sub and CA. The Sub corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CA.
        2) The CA reschedules the test and the test is repeated.

    b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

1) The deficiency shall be documented on the non-compliance form with the Sub's response and a copy given to the GC and to the Sub representative assumed to be responsible.
2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E.
3) The CA documents the resolution process.
4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CA. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting.

   a. The cost to retest a prefunctional or functional test, if the Contractor is responsible for the deficiency, shall be born by the Contractor.
   b. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CA will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CA's time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.
   c. The time for the CA to direct any retesting required because a specific *prefunctional* checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the Contractor,.
   d. Refer to the sampling section of 019113, Part 3.6 for requirements for testing and retesting identical equipment.

6. The Contractor shall respond in writing to the CA at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
7. The CA retains the original non-conformance forms until the end of the project.
8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the A/E. In such case, the Contractor shall provide the A/E with the following:

   a. Within one week of notification from the A/E, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the A/E within two weeks of the original notice.
   b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
   c. The A/E will determine whether a replacement of all identical units or a repair is acceptable.

d. Two examples of the proposed solution will be installed by the Contractor and the CA will test the installations for up to one week, upon which the A/E will decide whether to accept the solution. The Contractor will be responsible for the cost of such testing.
e. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA, if necessary. The CA recommends acceptance of each test to the A/E using a standard form. The A/E gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

3.8. OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content and format requirements for the standard O&M manuals are detailed in Section 017823. Special requirements for the controls contractor and TAB contractor are found Section 230800

2. CA Review and Approval. Prior to substantial completion, the CA shall review the O&M manuals, documentation and redline as-builds *for systems that were commissioned* and to verify compliance with the *Specifications.* The CA will communicate deficiencies in the manuals to the, PM or A/E, as requested. Upon a successful review of the corrections, the CA recommends approval and acceptance of these sections of the O&M manuals to the PM or A/E. The CA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

B. Commissioning Record in O&M Manuals.

1. The CA is responsible to compile, organize and index the following commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the Contractor, to be included with the O&M manuals. Three copies of the manuals will be provided. The format of the manuals shall be:

Tab I-1 Commissioning Plan
Tab I-2 Final Commissioning Report (see (B.2) below)
Tab 01 System Type 1 (chiller system, packaged unit, boiler system, etc.)
Sub-Tab A Design narrative and criteria, sequences, approvals for Equipment 1

Sub-Tab B Startup plan and report, approvals, corrections, blank prefunctional checklists

Colored Separator Sheets—for each equipment type (fans, pumps, chiller, etc.)

Sub-Tab C Functional tests (completed), trending and analysis, approvals and corrections, training plan, record and approvals, blank functional test forms and a recommended recommissioning schedule.

Tab 02 System Type 2.....repeat as per System 1

2. Final Report Details. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas: 1) Equipment meeting the equipment specifications, 2) Equipment installation, 3) Functional performance and efficiency, 4) Equipment documentation and design intent, and 5) Operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

3. Other documentation will be retained by the CA.

3.9 TRAINING OF OWNER PERSONNEL

A. The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

1. The CA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CA shall decide how rigorous the training should be for each piece of commissioned equipment. The CA shall communicate the results to the Subs and vendors who have training responsibilities.
2. In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors is specified in Divisions 23 and 26. .
3. Each Sub and vendor responsible for training will submit a written training plan to the CA for review and approval prior to training. The plan will cover the following elements:
   a. Equipment (included in training)
   b. Intended audience
   c. Location of training
   d. Objectives
   e. Subjects covered (description, duration of discussion, special methods, etc.)
   f. Duration of training on each subject
   g. Instructor for each subject
   h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
   i. Instructor and qualifications
4. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
5. The CA develops an overall training plan and coordinates and schedules, with the Contractor, the overall training for the commissioned systems. The CA develops criteria for determining

that the training was satisfactorily completed, including attending some of the training, etc. The CA recommends approval of the training to the A/E using a standard form. The PM also signs the approval form.

6. At one of the training sessions, the CA will give a presentation discussing the use of the blank functional test forms for re-commissioning equipment.
7. Video taping of the training sessions will be provided by the CA with tapes cataloged by the CA and added to the O&M manuals.
8. The mechanical design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall include a review of all systems using the simplified system schematics (one-line drawings).

3.10 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the A/E. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) of heating or refrigeration equipment shall be completed as part of this contract. The CA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.

3.11 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the *Specifications*. The *Commissioning Plan—Construction Phase,* lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

Product	Developed By
1. Final commissioning plan	CA
2. Meeting minutes	CA
3. Commissioning schedules	CA with Contractor
4. Equipment documentation submittals	Subs
5. Sequence clarifications	Subs and A/E as needed
6. Prefunctional checklists	CA (already in Specs)
Product	**Developed By**
7. Startup and initial checkout plan	Subs and CA (compilation of existing documents)
8. Startup and initial checkout forms filled out	Subs
9. Final TAB report	TAB
10. Issues log (deficiencies)	CA
11. Commissioning Progress Record	CA
12. Deficiency reports	CA

13.	Functional test forms	CA
14.	Commissioning Specifications	CA
15.	Filled out functional tests	CA
16.	O&M manuals	Subs
17.	Commissioning record book	CA
18.	Overall training plan	CA
19.	Specific training agendas	Subs
20.	Final commissioning report	CA
21.	Misc. approvals	CA

END OF COMMISSIONING REQUIREMENTS

SECTION 02 8070

ASBESTOS ABATEMENT SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of this Contract comprises of asbestos abatement located at Edgemont School District's Resource Building.

B. The work includes the removal and disposal of the following asbestos containing materials:
   1. Sink Mastic
   2. Pipe/Fitting Insulation

1.02 CONTRACTS

A. Division of Work
   1. Asbestos Abatement Contractor
      a. Perform Work required and as specified in the following specification sections and divisions: Divisions 00 through 02.
      b. Perform Work required and indicated on the following HM Series drawings.
         - HM100
   2. The above listing of drawings and specifications is intended as a guide and does not relieve the Contractors of the responsibility of reviewing all drawings and specifications for bidding and coordinating with others during the construction period. Review Contract Documents before submitting proposals.

1.03 WORK BY OTHERS

A. Work on the project site which will be executed prior to the start of the Work of this Contract, and which is excluded from this Contract, is as follows:
   1. None

B. Work on the project site which will be executed after completion of the Work of this Contract, and which is excluded from this Contract, is as follows:
   1. None

1.04 DESCRIPTION OF WORK

A. The Work specified herein shall be the removal of asbestos containing materials by competent persons trained, knowledgeable, and qualified in the techniques of abatement, handling, and disposal of asbestos containing and asbestos contaminated materials and the subsequent cleaning of contaminated areas, who comply with all applicable federal, state, and local regulations and are capable of and willing to perform the Work of this Contract.

B. The Contractor shall supply labor, materials, services, insurance, permits, and equipment necessary to carry out the Work in accordance with all applicable federal, state, and local regulations and these specifications.

C. The Contractor is responsible for restoring the Work area and auxiliary areas utilized during the abatement to conditions equal to or better than original. Damages caused during the performance of abatement activities shall be repaired by the Contractor (e.g., paint peeled off by barrier tape, nail holes, water damage, broken glass) at no additional expense to the Owner.

1.05 WORK SEQUENCE

A. Construct Work in stages to accommodate the Owner's use of the premises during the construction period. Coordinate construction schedule with the Engineer.

B. Construct Work in stages to provide for public convenience.

1.06 PARTIAL OWNER OCCUPANCY

A. The Owner will occupy the existing building during the construction period and will maintain normal operations. The Owner will cooperate with the Contractor to facilitate the continuity and the progress of the Work. Cooperate with the Owner by minimizing the disturbance of the Owner's activities in spaces adjacent to the construction Work.

B. Protect the occupants against hazards of the asbestos abatement and other construction operations and also provide access to Owner-occupied spaces. If elimination of access to any occupied space becomes necessary, it shall occur only after advance notice and special arrangements with the Owner.

C. Provide necessary barricades, temporary partitions, other separations, and closures to protect the occupants of the building from harm or injury due to the construction operations, to restrict occupancy of construction areas to construction workers, and to prevent dust and debris caused by construction activities from entering Owner-occupied spaces.

1.07 COORDINATION

A. The Contractor shall work with the others at the job site to maintain continuity of Work in accordance with the project schedule. The Contractor must cooperate to the maximum extent with the other Contractors to facilitate the execution of their Work. Timely notice of change in the Contractor's schedule shall be given to the others and to the Engineer so that all operations may be rescheduled or modified as required.

B. In case of conflicts occurring because of failure to abide by the requirements of the above paragraph, the Engineer's decision will be final, and no extra compensation will be awarded for extra work caused by failure to follow the above requirements.

C. The Owner or his representative shall have the right to stop the work immediately if the Contractor does not adhere to the specifications contained herein. Such notice can be verbal or in writing. If a verbal order is given, a written order must follow.

1.08 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. The lists of equipment, tabulations of data measurements, and schedules appearing in the specifications or drawings are included only for the assistance and guidance of the Contractor in arriving at a more complete understanding of the intended installation. They are not intended, or to be construed, as relieving the responsibility of the Contractor in making his own takeoff.

1.09 ABBREVIATIONS AND SYMBOLS

A. Contractor is expected to be familiar with the standard abbreviation symbols used in the Contract Documents. Inform the Engineer, in writing, of any unclear or unknown abbreviation or symbol prior to the Bid Date. Unless notified, the Engineer will assume that the Contractor is fully familiar with all such items and can execute his Work accordingly.

1.10 PROTECTION OF EXISTING BUILDING AND GROUNDS

A. Provide protection to prevent damage to building, both interior and exterior, during construction operations.

B. Repair damage to building and grounds to satisfaction of the Owner.

1.11 PROTECTION OF EQUIPMENT AND MATERIALS

A. Assume full and complete responsibility for protection and safe-keeping of his products and equipment stored at project location.

1.12 PROTECTION OF UTILITIES

A. Provide and maintain adequate protection for existing utilities. Repair such Work damaged during construction to the satisfaction of the Engineer.

1.13 ASBESTOS PROJECT MONITOR

A. Perform work only when the Asbestos Project Monitor is on site unless otherwise instructed in writing by the Engineer.

B. Perform work only during the hours of work established at the Pre-Construction Meeting or as approved in writing by the Engineer at least 24 hours in advance of the change. This will allow the Asbestos Project Monitor to monitor the Work in progress.

NOTE: THE CONTRACTORS ARE HEREBY NOTIFIED THAT IN THE EVENT THE CONTRACTORS, THEIR EMPLOYEES OR SUBCONTRACTORS ENCOUNTER A MATERIAL OR CONDITION WHICH IS UNKNOWN OR WHICH MAY BE SUSPECTED TO CONTAIN ASBESTOS OR OTHER HAZARDOUS MATERIAL, THE CONTRACTOR WILL NOT DISTURB THE MATERIAL, BUT SHALL STOP WORK IN THAT AREA AND NOTIFY THE OWNER IN WRITING IMMEDIATELY OF THE CONDITION OR MATERIAL.

END OF SECTION

SECTION 02 8071

ASBESTOS ABATEMENT REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. All Work under this Contract shall be done in strict accordance with all applicable federal, state, and local regulations, standards, and codes governing asbestos abatement and any other trade work done in conjunction with the abatement.

B. The most recent edition of any relevant regulation, standard, document, or code shall be applicable to the Work. Where conflict among the requirements or with these specifications exists, the most stringent requirements are applicable.

C. Copies of all standards, regulations, codes, and other applicable documents and subsequent amendments thereto, listed in this section and including this specification, shall be available at the work site in the clean change area of the worker decontamination system.

PART 2 - SPECIFIC REQUIREMENTS

2.01 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

A. OSHA regulations governing asbestos abatement include, but are not limited to:
1. Title 29 CFR 1926.1101, Occupational Exposure to Asbestos Construction Standard.
2. Title 29 CFR 1910.1001, General Industry Standard for Asbestos.
3. Title 29 CFR Section 1910.134, General Industry Standard for Respiratory Protection.
4. Title 29 CFR Section 1910.20, Access to Employee Exposure and Medical Records.
5. Title 29 CFR Section 1910.1200, Hazard Communication.
6. Title 29 CFR Section 1910.145, Specifications for Accident Prevention Signs and Tags.
7. Title 29 CFR Section 1910.95, Noise Regulation.

2.02 ENVIRONMENTAL PROTECTION AGENCY (EPA)

A. EPA regulations governing asbestos abatement include, but are not limited to:
1. Title 40 CFR Part 61, Subparts A and M, National Emission Standard for Asbestos.
2. Title 40 CFR Part 763, Subpart G, Asbestos Abatement Project.
3. Title 40 CFR Part 763, Asbestos Containing Materials in Schools, Final Rule and Notice.

2.03 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

A. ANSI standards governing asbestos abatement include, but are not limited to:
1. Fundamentals Governing the Design and Operation of Local Exhaust Systems, Publication 29.2-79.
2. Practices for Respiratory Protection, Publication Z88.2-80.

2.04 COMPRESSED GAS ASSOCIATION (CGA)

A. Pamphlet G-7, "Compressed Air for Human Respiration" and Specification G-7.1, “Commodity Specification for Air.”

2.05 MINE SAFETY AND HEALTH ADMINISTRATION (MSHA)

A. Certification of respirators as per 30 CFR Part 11.

2.06 NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

A. NIOSH regulations governing asbestos abatement include, but are not limited to:
1. A guide to respiratory protection for the asbestos abatement industry.
2. Approval of respirators as per 30 CFR Part 11.
3. Standards for analysis of air samples.

2.07 CANADIAN STANDARD ASSOCIATION

A. Standard Z180.1-1978, "Compressed Breathing Air."

2.08 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A. Standard Guide for Visual Inspection of Asbestos Abatement Projects.

2.09 NEW YORK STATE REQUIREMENTS

A. State regulations governing asbestos abatement include, but are not limited to:
   1. New York State Department of Environmental Conservation (NYSDEC), Title 6 NYCRR, Part 360 and 364, The New York State Hazardous Waste Management Regulations.

B. Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations.

C. Chapter II: Title 10, Part 73 of the New York Code of Rules and Regulations: Asbestos Safety Program Requirements.

D. New York State Education Department regulations.

2.10 LICENSES

A. Maintain current licenses as required by applicable state or local jurisdictions for the removal, transportation, disposal, or other regulated activity relative to the Work of this Contract.

2.11 NEW AND AMENDED REGULATIONS

A. Any and all new or amended federal, state, or local regulations becoming effective during this project and not listed are to be considered as part of this specification.

2.12 NOTICES

A. USEPA: Send written notification in accordance with 40 CFR Part 61.146 to the Regional Asbestos Contact responsible for the enforcement of the National Emission Standard for Asbestos at least ten (10) days prior to the commencement of any on-site project activity. Send notification to the following address:

Region 2

Asbestos NESHAPS Contact

Air and Waste Management Division

USEPA

26 Federal Plaza

New York, New York 10007

B. NYS Department of Labor: Send written notification in accordance with Part 56 of Title 12 to the Asbestos Control Bureau of the NYS Department of Labor's Division of Safety and Health. Use forms provided by the Department of Labor.

END OF SECTION

SECTION 02 8073

ASBESTOS ABATEMENT SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Testing Laboratory Services: Section 02 8074

B. Schedule submittals to be presented at the pre-construction meeting. Indicate items where additional time is needed and on what dates they will be submitted. The dates indicated for each submittal shall take into account the lead time required for ordering and fabricating of the various items.

1.02 SUBMISSION REQUIREMENTS

A. Pre-contract Submittals. Within three days after bids are opened, the three apparent low bidders shall be required to submit the following documentation:
   1. Resume: Shall include the following:
      a. Contractor license issued by New York State Department of Labor.
      b. The number of years engaged in asbestos removal.
      c. An outline of the worker training course and medical surveillance program conducted by the contractor.
      d. A standard operating procedures manual describing work practices and procedures, equipment, type of decontamination facilities, respirator program, special removal techniques, etc.
   2. Citations/Violations/Legal Proceedings
      a. Submit a notarized statement describing any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous abatement contracts. Briefly describe the circumstances citing the project and involved persons and agencies as well as the outcome of any actions.
      b. Answer the question: "Has your firm or its agents been issued a Stop Work Order on any project within the last two years?" If "Yes", provide details as discussed above.
      c. Answer the question: "Are you now, or have you been in the past, a party to any litigation or arbitration arising out of your performance on asbestos abatement contracts?" If "Yes", provide details as discussed above.
      d. Describe any liquidated damages assessed within the last two years.
   3. Preliminary Schedule
      a. Provide an estimate of manpower to be utilized and the time required for completion of each major work area. Include the size and number of crews and work shifts.

B. Prior to Commencement of Work, Owner will:
   1. Submit to the Contractor results of pre-abatement air sampling (if conducted) including location of samples, names of the Air Sampling Professional, equipment utilized, and method of analysis.
   2. Document that Owner's employees who will be required to enter the work area during abatement have received training equal to that detailed in Section 02 8080.

C. Prior to Commencement of Work, Contractor shall:
   1. NYS Department of Labor: Provide Owner with a copy of the notice to the Asbestos Control Program of the NYS Labor Department's Division of Safety and Health as per Part 56 of Title 12.
   2. NYSDEC: Submit to the Owner a copy of the annual "Industrial Waste Hauler Permit" specifically for asbestos-containing materials required pursuant to 6 NYCRR364. Submit certification that the proposed waste disposal site meets the requirements of 40 CFR 61.156 and any pertinent local and state regulations. Provide Owner with a copy of the notice to the Asbestos Enforcement Division of the NYSDEC.
   3. Submit documentation satisfactory to the Owner that the Contractor's employees, including Superintendent, Foremen, Supervisors, and other company personnel or agents, who may be exposed to airborne asbestos fibers or who may be responsible for any aspects of abatement

activities, have received adequate training. A copy of their Asbestos Handling Certificates will be provided. Foremen and Supervisors shall, at a minimum, meet the training requirements of a competent person as defined in 29 CFR 1926.1101.

4. Submit to the Owner shop drawings for layout and construction of decontamination enclosure systems and barriers for isolation of the work area as detailed in Section 028081 of this specification and required by applicable regulations.
5. With the Owner, inspect the premises wherein all abatement and abatement related activities will occur and prepare a statement signed by both agreeing on building and fixture conditions prior to the commencement of work.
6. Submit manufacturer's certification that HEPA vacuums, negative pressure ventilation units, and other local exhaust ventilation equipment conform to ANSI Z9.2-79.
7. When rental equipment is to be used in abatement areas or to transport asbestos-contaminated waste, a written notification concerning intended use of the rental equipment must be provided to the rental agency with a copy submitted to the Owner.
8. Provide a copy of the respiratory program required in 29 CFR 1910.134 (b), (d), (e), and (f). Include manufacturer certification of HEPA filtration capabilities for all cartridges and filters.
9. Submit a copy of the firm's asbestos handling license.
10. Submit the name, address, contact person and the ELAP approval number for the laboratory utilized for the analysis of the Contractor's OSHA monitoring.
11. Progress Schedule:
    a. Show the complete sequence of construction by activity and the sequencing of work within each building or section of the work.
    b. Show the dates for the beginning and completion of each major element of work including substantial completion dates for each work area, building, or phase.
    c. Show projected percentage of completion for each item, as of the first day of each month.
    d. Show final inspection dates.
12. Abatement Work Plan: Provide plans which clearly indicate all work areas (numbered sequentially) including the locations and types of all decontamination chambers, entrances and exits to the work area, type of abatement activity/technique, number and location of negative air units and exhaust including calculations, and the proposed location and construction of storage facilities and field office.
13. Worker Training and Medical Surveillance: The Contractor shall submit a list of the persons who will be employed by him and his subcontractors in the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
14. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.
15. Material List: A complete materials list of all items proposed to be furnished and used under this contract.
16. Subcontractors List: The prime contractor shall submit a list of all subcontractors to be used on the project.
17. Material Safety Data Sheets (MSDS): Submit copies of MSDS for each chemical or material used for the project (encapsulant, surfactant, mastic remover, etc.)
18. Project Supervisor: Submit the resume of the proposed Project Supervisor.
19. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of asbestos containing materials; understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.

D. During abatement activities, Contractor shall:
1. Submit copies of all transport manifests, trip tickets, and disposal receipts for all asbestos waste materials removed from the work area during the abatement process. The documentation must show the entire chain of custody from the time the asbestos is removed.
2. The Contractor will maintain worksite entry log books with information on worker and visitor access. The Asbestos Handling Certificates for all workers will be kept at the entrance to the work

site or the certificates will checked upon each entry by the Contractor. Copies will be provided to the Owner, Engineer, and Contractor.

3. Submit logs documenting filter changes on respirators, HEPA vacuums, negative pressure ventilation units, and other engineering controls.
4. Submit results of bulk material analysis and air sampling data collected during the course of the abatement including OSHA compliance air monitoring results.
5. Submit results of materials testing conducted during the abatement for purposes of utilization during abatement activities (e.g., testing of encapsulant for depth of penetration and testing of substitute materials for adherence to encapsulated surfaces).
6. Post in the clean room area of the worker decontamination enclosure a list containing the names, addresses, and telephone numbers of the Contractor, the Owner, the Engineer, the Asbestos Project Monitor, the General Superintendent, the Air Sampling Professional, the testing laboratory, the police department, the fire department, and any other personnel who may be required to assist during abatement activities (e.g., Safety Officer, Building Maintenance Supervisor, and Energy Conservation Officer).

E. Project Closeout Submissions:
   1. Submit copies of all waste disposal manifests, seals, and disposal logs.
   2. Submit OSHA compliance air monitoring records conducted during the work.
   3. Submit copies of the daily progress log.
   4. Submit copies of the Visitor's log.
   5. Submit Certificate of Visual Inspection.
   6. Submit copies of any required Employee Statements such as Medical Examination Statement, Certificate of Worker's Release, or Employee Training Statement.

END OF SECTION

SECTION 02 8073.01

SUBMITTAL COVER SHEET

1.01 EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NY 13501 PHONE: 315-735-1916
EMAIL: MINMAN@ERENGPC.COM

1.02 NAME OF PROJECT: EDGEMONT SCHOOL DISTRICT
E&R PROJECT NUMBER: 14-21-04 CLIENT'S PROJECT NUMBER: _____

1.03 CONTRACTOR/SUBCONTRACTOR:_____

DATE OF SUBMITTAL:_____

SUBMITTAL TITLE: _____

SHOP DRAWING TITLE:_____

SUBMITTAL NUMBER: _____ REVISION NUMBER: _____ DATE:_____

PRODUCT DATA, TESTS, SCHEDULES: _____

SAMPLES: _____

MANUFACTURER: _____

SPECIFICATION SECTION(S): _____

CONTRACT DRAWING(S): _____

ENGINEER'S STAMP:	**COMMENTS:**
____NO EXCEPTION TAKEN ____REJECTED **____MAKE CORRECTIONS NOTED ____REVISE AND RESUBMIT** **____SUBMIT SPECIFIED ITEM** **CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. NOTATIONS ARE SUBJECT TO THE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS. THE CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE: FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION, COORDINATION OF THE WORK WITH THAT OF ALL OTHER TRADES AND THE SATISFACTORY PERFORMANCE OF THE WORK.** **EISENBACH & RUHNKE ENGINEERING, PC** **DATE:_____ BY: _____**	

END OF SECTION

SECTION 02 8074

ASBESTOS ABATEMENT TESTING LABORATORY SERVICES QUALITY CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Asbestos Abatement Submittals: Section 02 8073
   2. Personnel Protection: Section 02 8080
   3. The Owner will obtain the services of a Project Monitor and analysis laboratory to constantly monitor airborne concentrations of asbestos throughout the course of the abatement project.
   4. Laboratory services, obtained by the Owner for bulk sampling, area air sampling, and clearance sampling, are to ensure that Contract provisions are met.
      a. Results of Owner-procured tests will be made available to the Contractor. This act shall not be construed as relieving the Contractor of his obligations to provide materials and workmanship in accordance with pertinent regulations.
   5. Laboratory services obtained by the Contractor for personnel sampling shall comply with all pertinent regulations.
      a. Forward copies of test results to the Owner as indicated in Section 02 8073.
   6. The air sampling to be done will be in accordance with an air sampling plan to be prepared by the Project Monitor and this specification. The plan will be approved by the Owner.

1.02 QUALITY ASSURANCE

A. Pre-Work Airborne Fiber Counts
   1. The Owner will monitor the baseline fiber counts or those prevalent in the area before work begins using the NIOSH 7400 analytical procedure.

B. Work Area Airborne Fiber Counts
   1. The Owner will monitor airborne fiber counts in the work area during the progress of the work through reviewing the personnel monitoring done by the contractor. The purpose of this air sampling will be to detect airborne fiber counts which may significantly challenge the ability of the work area isolation procedures to protect the balance of the building or outside of the building from contamination by airborne fibers.

C. Work Area Clearance
   1. To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to an acceptable level, the Owner will sample and analyze air as per this Section using either Phase Contrast Microscopy (PCM) and/or Transmission Electron Microscopy (TEM).

D. The Owner will be conducting air sampling throughout the course of the project.

E. Fibers Counted
   1. PCM: "Airborne Fibers" referred to above include all fibers regardless of composition as counted in the NIOSH 7400 procedure.
   2. TEM: "Airborne Fibers" referred to above and to be analyzed using the method defined in 40 CFR Part 763.

F. The laboratory utilized for analyzing air samples shall be satisfactory participants in the AIHA Proficiency Analytical Testing (PAT) program for asbestos analysis and shall be NYSDOH (New York State Department of Health) ELAP accredited.

G. Laboratories used for bulk material identification shall be satisfactory participants in the EPA quality assurance program for bulk asbestos analysis and shall be NYSDOH ELAP accredited.

H. The Project Monitor shall have a current Project Monitor certificate.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 TESTING LABORATORY SERVICES

A. The Owner will obtain air and bulk sampling laboratory services by separate Contract. The laboratory will be independent of the abatement contractor.

B. Personal Air Monitoring
   1. In addition to the requirements of OSHA 1926.1101, the contractor shall be required to perform personal air monitoring every work shift, in each work area, during which abatement activities occur, in order to determine that appropriate respiratory protection is being utilized.
   2. Results of the air monitoring shall be returned to the site, at least verbally, and posted no later than 24 hours following the time the sample was collected. Written results shall be returned to the site and posted no more than five days after the monitoring was performed.
   3. Personal air samples shall be analyzed by a laboratory which holds certification by the New York State Department of Health's Environmental Laboratory Approval Program. The asbestos consultant must approve the laboratory the contractor intends to use.

3.02 RESPONSIBILITIES AND DUTIES OF CONTRACTOR

A. To facilitate testing services, the Contractor shall:
   1. Furnish to the laboratory such samples of materials as may be necessary for testing purposes.
   2. Advise the testing agency sufficiently in advance of operations to allow for completion of tests and for the assignment of personnel.
   3. Ensure the cooperation of the employees and superintendent with the Project Monitor.

3.03 ANALYTICAL METHODS

A. The following methods may be used by the testing laboratory in analyzing filters used to collect air samples:
   1. Cellulose ester filters will be analyzed using the NIOSH 7400 Method accounting rules.

3.04 SAMPLE VOLUMES

A. General: The number and volume of air samples taken by the Owner will be in accordance with the following schedule. Sample volumes given may vary depending upon the analytical method used.

B. Before the Start of Work
   1. The Owner will secure the following air samples to establish a base line before the start of work.

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE BUILDING	2	CELLULOSE ESTER	0.01	1500	2-10
AT JOB SITE	2	CELLULOSE ESTER	0.01	0	0

A. Base line is an action level by sample location and expressed in fibers per cubic centimeter which is the largest of the following:

1. Actual fiber concentration of the samples collected on cellulose ester filters for each work area.
2. 0.01 fibers per cubic centimeter.

B. Daily During Preparation

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE BUILDING	2	CELLULOSE ESTER	0.01	1500	2-10
AT JOB SITE	2	CELLULOSE ESTER	0.01	0	0

A. Daily During Abatement
   1. From the start of work building temporary enclosures until ready for clearance air monitoring, the laboratory will take the following samples on a daily basis.

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
OUTSIDE EACH WORK AREA *	4	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE BUILDING	1	CELLULOSE ESTER	0.01	1500	2-10
OUTPUT NEGATIVE PRESSURE SYSTEM		CELLULOSE ESTER	0.01	1500	2-10
AT JOB SITE		CELLULOSE ESTER	0.01	0	0

*** TWO (2) SAMPLES OUTSIDE THE WORK AREA BUT WITHIN TEN (10) FEET OF ISOLATION BARRIERS. TWO (2) SAMPLES AT LOCATION WITHIN TEN (10) FEET OF AND WITHIN THE ACTUAL ENVIRONMENT OF THE ENTRANCE EXIT OF THE PERSONNEL AND WASTE DECONTAMINATION ENCLOSURES.**

A. If airborne fiber counts exceed allowed limits additional samples will be taken as necessary to monitor fiber levels.

B. Clearance Air Monitoring
   1. Air sample locations shall be the same as the locations of the samples collected before the start of work.
   2. All air samples will be taken using aggressive sampling techniques as follows:

a. There are no standards available for flow rate of leaf blowers or large fans. However, this information is not critical to the success of the procedure.
b. Before sampling pumps are started, the exhaust from forced air equipment (leaf blower with at least 1 horsepower electric motor) will be swept against all walls, ceilings, floors, ledges and other surfaces in the room. This procedure will be continued for five minutes per 1,000 cubic feet of floor.
c. One 20 inch diameter fan per 10,000 cubic feet of room volume will be mounted in a central location at approximately 2 meters above floor, directed toward ceiling, and operated at low speed for the entire period of sample collection.
d. Air samples will be collected in areas subject to normal air circulation away from room corners, obstructed locations, and sites near windows, door, or vents.
e. After air sampling pumps have been shut off, fans will be shut off.

3. Schedule of Air Samples
   a. General: The number and volume of air samples taken and analytical methods used by the Owner will be in accordance with the following schedule. Sample volumes given may vary depending upon the analytical instruments used.
4. Phase/Contrast Microscopy
   a. In each homogeneous work area after completion of all cleaning work, a minimum of 13 samples will be taken and analyzed as follows:

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
Each Work Area	5	CELLULOSE ESTER	0.01	1500	2-10
Outside Work Area	5	CELLULOSE ESTER	0.01	1500	2-10
At Job Site	2	CELLULOSE ESTER	0.01	0	0
At Laboratory	1	CELLULOSE ESTER	0.01	0	0

a. Analysis: Fibers on each filter will be measured using the NIOSH 7400 procedure accounting rules.
b. Split Sample: One work area sample will be split and both halves analyzed separately for duplicate analysis.
c. Satisfactory Clearance Air Monitoring Results: PCM clearance air monitoring is considered to be satisfactory only when every sample is <.01 f/cc unless otherwise directed by the Engineer.

3.05 LABORATORY TESTING

A. Phase Contrast Microscopy
   1. The services of a testing laboratory will be employed by the Owner to perform laboratory analysis of the air samples. Samples will be sent daily by overnight mail so that verbal reports on air samples can be obtained within 24 hours. A complete record, certified by the testing laboratory, of all air monitoring tests and results, will be furnished to the Owner's Representative, the Owner, and the Contractor.
      a. Written reports of all monitoring tests will be posted at the job site on a daily basis.

2. The personnel monitoring done by the Contractor will be conducted in accordance with the standards outline in sub-paragraph 1 above.

3.06 ADDITIONAL TESTING

A. The Contractor may conduct his own air monitoring and laboratory testing. If he elects to do this, the cost shall be included in the Contract sum.

B. If it is necessary to resample work areas for clearance testing because the area does not meet the release criteria, the Abatement Contractor will bear all costs for this additional sampling.

C. If the Contractor does not adhere to the schedule and the Owner incurs additional air monitoring costs as a result, the additional costs will be paid by the Contractor. This will not apply if the project is delayed because of an Owner caused delay.

3.07 DATA SUBMITTAL

A. The Project Monitor will submit all clearance air monitoring data to the NYSDOL in accordance with Industrial Code Rule 56.

END OF SECTION

SECTION 02 8075

ASBESTOS ABATEMENT TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall:
   1. Provide temporary facilities throughout the construction period, unless otherwise indicated.

PART 2 - FACILITIES

2.01 TEMPORARY SANITARY FACILITIES

A. Provide and maintain sanitary facilities for all personnel on the project.
   1. The number of sanitary facilities required shall be based on the total number of workmen employed on the project and shall be in accordance with the provisions of the applicable codes.

B. Maintain in a sanitary and clean condition at all times.

2.02 TEMPORARY WATER

A. The Owner will provide water.
   1. Contractor is to provide and maintain temporary connections to the designated outlet for construction water. Provide and maintain hoses, piping, and valves as required for obtaining construction water.
   2. Provide and maintain temporary connections to the designated outlet for cold shower water in the decontamination unit. Provide and maintain a hot water heater of sufficient capacity to provide hot water for showers for all workers.
   3. Provide anti-siphon prevention valves on each connection to Owner's outlet.

B. All care must be exercised in the use of water furnished by the Owner.

2.03 FIRE PROTECTION

A. Provide and maintain portable fire extinguishers on each floor level and building area. Number to conform to applicable codes.

B. Fire Extinguishers: Multipurpose (ABC) dry chemical both inside and outside the work area.

C. UL labeled.

2.04 STORAGE

A. Storage space is limited and will be permitted in areas designated by the Engineer.

2.05 TEMPORARY POWER

A. Electrical service will be provided by the Owner at no cost.

B. Contractor shall be responsible for extending the service to provide lighting and power required to complete the Work of this Contract.

C. Comply with the National Electrical Code, OSHA requirements, and applicable local codes and utility regulations.

D. Maintain continuous service and provide safe working conditions.

E. Do not overload circuits. Verify capacity of circuit prior to use.

F. Provide ground fault protection for all temporary power sources.

G. Temporary power and lighting cords will be elevated to keep them away from water on the floor and damage from foot traffic and scaffolds.

2.06 TEMPORARY PHONE

A. Provide a phone and service at the job site.

PART 3 - EXECUTION

3.01 GENERAL

A. Install temporary facilities in accordance with applicable codes.

B. Maintain temporary facilities throughout the construction period.

C. Remove temporary facilities when they are no longer required or when directed by the Engineer.

D. Repair damage to the project site caused by the installation of temporary facilities.

END OF SECTION

SECTION 02 8078

ASBESTOS ABATEMENT SITE SECURITY

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Submittals: Section 02 8073

B. The Contractor shall provide all controls required to comply with all pertinent regulations and the Contract Documents including, but not limited to, those described in this section.

PART 2 - CONTROLS

2.01 SITE SECURITY

A. The Work area is to be restricted to authorized, trained, and protected personnel. These may include the Contractor's employees, employees of subcontractors, Owner employees and representatives, state and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to job start and posted in the clean room of the worker decontamination facility.

B. Entry into the Work area by unauthorized individuals shall be reported immediately to the Owner by the Contractor.

C. A log book shall be maintained by the Contractor in the clean room area of the worker decontamination system. Anyone who enters the Work area must record name, affiliation, time in, and time out for each entry. The asbestos handlers shall show their certification card or have a copy on file at the entrance upon their first entry of the day.

D. Access to the Work area shall be through a single worker decontamination system. All other means of access (doors, windows, hallways, etc.) shall be blocked or locked so as to prevent entry to or exit from the Work area. The only exceptions for this rule are the waste pass-out air-lock which shall be sealed except during the removal of containerized asbestos waste from the Work area, and emergency exits in case of fire or accident. Emergency exits shall not be locked from the inside; however, they shall be sealed with polyethylene sheeting and tape until needed.

E. The Project Monitor should have control of site security during abatement operations whenever possible, in order to protect Work efforts and equipment.

F. Contractor will have Owner's assistance in notifying building occupants of impending activity and enforcement of restricted access by Owner's employees.

G. If the decontamination chamber or the waste pass-out chamber is located outside the building, provide a security guard 24 hours a day and a fence around the site.

END OF SECTION

SECTION 02 8079

ASBESTOS ABATEMENT EMERGENCY PLANNING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Submittals: Section 02 8073

B. The Contractor shall prepare an emergency preparedness plan detailing at least the information required in this section and in any pertinent federal, state, or local regulations.

PART 2 - DETAILS OF PLAN

2.01 EMERGENCY PLANNING

A. Emergency planning shall be developed prior to abatement initiation and agreed to by Contractor and Owner.

B. Emergency procedures shall be in written form and prominently posted in the clean change area and equipment room of the worker decontamination area. Everyone, prior to entering the work area, must read and sign these procedures to acknowledge receipt and understanding of work site layout, location of emergency exits, and emergency procedures.

C. Emergency planning shall include written notification of police, fire and emergency medical personnel of planned abatement activities, work schedule and layout of work area, particularly barriers that may affect response capabilities.

D. Emergency planning shall include considerations of fire, power failure, explosion, toxic atmospheres, electrical hazards, slips, trips and falls, confined spaces, and heat related injury. Written procedures shall be developed and employee training in procedures shall be provided.

E. Employees shall be trained in evacuation procedures in the event of workplace emergencies.
   1. For Non-Life-Threatening Situations: Employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the workplace to obtain proper medical treatment.
   2. For Life-Threatening Injury or Illness: Worker decontamination shall take least priority. After measures to stabilize the injured worker, remove him from the workplace and secure proper medical treatment.

F. Telephone numbers of all emergency response personnel shall be prominently posted in the clean change area and equipment room, along with the location of the nearest telephone.

END OF SECTION

SECTION 02 8080

ASBESTOS ABATEMENT PERSONNEL PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Regulatory Requirements: Section 02 8071
   2. Testing Laboratory Services: Section 02 8074

B. Description of Work
   1. This section describes the equipment and procedures required for worker and authorized visitor protection against asbestos contamination and other hazards.

1.02 SUBMITTALS

A. Asbestos Handling Certificate
   1. Each worker will have a current asbestos handling certificate issued by the NYS Department of Labor. Copies will be submitted to the Engineer.

B. Product Data
   1. Submit manufacturer's product data for all components of respiratory systems proposed to be utilized.

C. Operations and Maintenance (O&M)
   1. Submit O&M manuals for respiratory systems.
   2. Submit the name and qualifications of the individual assigned to monitor the supply air respiratory system.

D. Respiratory Protection Program
   1. Provide the respiratory protection program detailed herein.

PART 2 - EQUIPMENT

2.01 RESPIRATORY PROTECTION EQUIPMENT

A. Respirators shall be provided that have been tested and approved by NIOSH MSHA under 30 CFR Part 11 for use in asbestos-contaminated atmospheres and bear the approval labels and TC numbers. The respirator chosen by the Contractor must ensure that the workers are not exposed to asbestos concentrations above the PEL, 0.1 f/cc, 8 hour TWA. The rules in 29 CFR 1926.1101 (h) shall govern the respirator selection.

B. Spectacle kits and eyeglasses must be provided for employees who wear glasses and who must wear full face piece respirators.

C. The nature of the encapsulant may affect the requirements for respiratory protection. Vapors that may be given off during encapsulant application must be taken into account when selecting respirators, if types other than air supplied are used.

D. The minimum level of respiratory protection allowable for all plaster and fireproofing work areas during gross removal will be PAPRs.

2.02 PROTECTIVE CLOTHING

A. Full body disposable protective clothing, including head, body, and foot coverings (unless using footwear as described below) consisting of material impenetrable by asbestos fibers (TyvekR or equivalent) shall be provided to all workers and authorized visitors in sizes adequate to accommodate movement without tearing. Provide a sufficient number for all required changes, for all workers in the work area.

B. Additional safety equipment (e.g., hard hats meeting the requirements of ANSI Standard Z89.1-1981, eye protection meeting the requirements of ANSI Standard Z87.1-1979, safety shoes meeting the requirements of ANSI Standard Z41.1-1967, disposable PVC gloves or other work gloves), as necessary, shall be provided to all workers and authorized visitors.

C. Nonskid footwear shall be provided to all abatement workers. Disposable clothing shall be adequately sealed to the footwear to prevent body contamination.

PART 3 - EXECUTION

3.01 TRAINING

A. All workers will have current Asbestos Handling Certificates issued by the New York State Commissioner of Labor.

B. Supervisory personnel shall be competent people, as defined in 29 CFR 1926.1101 (b), and shall receive training as required in 29 CFR 1926.1101 and have a current Supervisor Certificate issued by the New York State Commissioner of Labor.

3.02 RESPIRATORY PROTECTION

A. All respiratory protection shall be provided to workers in accordance with the submitted written respiratory protection program, which includes all items in OSHA 29 CFR 1910.134 (b), (d), (e), and (f). This program shall be posted in the clean room of the worker decontamination enclosure system.

B. Workers shall be provided with personally issued, individually identified (marked with waterproof designations) respirators.

C. Respirators shall be selected that meet the following level of protection requirements: The workers will not be exposed to in excess of 0.1 f/cc, 8-hour TWA.

D. When air tests show the level of asbestos exceeds 0.1 f/cc, the permissible exposure level, the Contractor will begin respiratory protection and personnel monitoring. At a minimum, half-face air purifying respirators will be worn during all preparation and cleaning operations.

E. During all removal operations, except glovebag removal, the minimum level of protection required is the powered air purifying respirator. During glovebag removal the minimum level of protection required is a half face negative pressure air purifying respirator.

F. Fit Testing
   1. Workers must perform positive and negative air pressure fit tests each time a respirator is put on, whenever the respirator design so permits. Powered air-purifying respirators shall be tested for adequate flow as specified by the manufacturer.
   2. Workers shall be given a qualitative fit test in accordance with procedures detailed in the OSHA Regulation (29 CFR 1926.1101, Appendix C, Qualitative and Quantitative Fit Testing Procedures) for all respirators to be used on this abatement project. The irritant fume protocol will be utilized. An appropriately administered quantitative fit test may be substituted for the qualitative fit test.

G. No one wearing a beard or other facial hair shall be permitted to don a respirator and enter the work area.

H. Additional respirators (minimum of two of each type) and training on their donning and use must be available at the work site for authorized visitors who may be required to enter the work area.

3.03 PROTECTIVE CLOTHING

A. Disposable clothing including head, foot, and full body protection shall be provided in sufficient quantities and adequate sizes for all workers and authorized visitors.

B. Hard hats, protective eyewear, gloves, rubber boots, and/or other footwear shall be provided as required for workers and authorized visitors. Safety shoes may be required for some activities.

C. Protective clothing shall not be worn outside the work area in lieu of street clothing.

3.04 MEDICAL SURVEILLANCE

A. Medical surveillance must be provided by the Contractor to any employee or agent that may be exposed to asbestos in excess of background levels during any phase of the abatement project. The surveillance program shall be in accordance with 29 CFR 1926.1101.

B. Employees shall be given an opportunity to be evaluated by a physician to determine their capability to work safely while breathing through the added resistance of a respirator.

C. Copies of the Medical Surveillance Documentation for each employee must be submitted.

END OF SECTION

SECTION 02 8084

ASBESTOS ABATEMENT MAINTENANCE OF RECORDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall maintain the records required in Title 29 CFR 1926.1101 (n) and Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York.

B. The Contractor shall provide the Owner and Engineer with 3 bound hard copies and 1electronic copy of all records.

C. Related Requirements Specified Elsewhere
   1. Submittals: Section 02 8073

END OF SECTION

SECTION 02 8086

ASBESTOS ABATEMENT WASTE DISPOSAL PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. As the work progresses, to prevent exceeding available storage capacity on site, sealed and labeled containers of asbestos-containing waste shall be removed and transported to the pre-arranged disposal location.

B. All containers of asbestos-containing waste shall be labeled with the name of the waste generator and the location at which the waste was generated.

C. Disposal of all regulated asbestos-containing material must occur at an authorized site in accordance with regulatory requirements of NESHAP 40 CFR 61.156, NYSDEC 6NYCRR364, and local guidelines and regulations.

D. All dump receipts; trip tickets, transportation manifests, or other documentation of disposal shall be delivered to the Owner for his records.

1. A record keeping format utilizing a chain of custody form which includes the names and addresses of the Generator (Owner), Contractor, pickup site, disposal site, the estimated quantity of the asbestos waste, and the type of containers used.
2. The form should be signed by the Generator, the Contractor, the truck drivers, and the disposal site operator, as the responsibility for the material changes hands.
3. If a separate hauler is employed, his name, address, telephone number, and signature should also appear on the form.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 TRANSPORTATION TO THE LANDFILL - (REGULATED ASBESTOS CONTAINING MATERIAL)

A. Once drums, bags, and wrapped components have been removed from the work area, they shall be loaded into an enclosed, hardbody, lockable truck for transportation.

B. When moving containers, utilize hand trucks, carts, and proper lifting techniques to avoid back injuries. Trucks with lift gates are helpful for raising drums during truck loading.

C. The enclosed cargo area of the truck shall be free of debris and lined with 2 layers of 6 mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first and extend up the sidewalls. Ceiling and wall sheeting shall be overlapped and taped into place.

D. Drums shall be placed on level surfaces in the cargo area and packed tightly together to prevent shifting and tipping. Large structural components shall be secured to prevent shifting and have bags placed on top. Do not throw containers into truck cargo area.

E. Personnel loading asbestos-containing waste shall be protected by disposable clothing including head, body, and foot protection, and at a minimum, half-face piece, air-purifying, dual cartridge respirators equipped with high efficiency filters.

F. Any debris or residue observed on containers or surfaces outside of the work area resulting from clean-up or disposal activities shall be immediately cleaned up using HEPA filtered vacuum equipment and/or wet methods as appropriate.

G. Large metal dumpsters are sometimes used for asbestos waste disposal. These should have doors or tops that can be closed and locked to prevent vandalism or other disturbance of the bagged asbestos debris and wind dispersion of asbestos fibers. Unbagged material shall not be placed in these containers, nor shall they be used for non-asbestos waste. Bags shall be placed, not thrown, into these containers to avoid splitting.

H. The waste hauler shall provide a copy of his "Industrial Waste Hauler Permit" specifically for asbestos-containing material required pursuant to NYSDEC regulation 6 NYCRR364.

3.02 DISPOSAL AT THE LANDFILL - (REGULATED ASBESTOS CONTAINING MATERIAL)

A. Upon reaching the landfill, trucks are to approach the dump location as closely as possible for unloading of the asbestos-containing waste.

B. Bags, drums, and components shall be inspected as they are off-loaded at the disposal site. Material in damaged containers shall be repacked in empty drums or bags as necessary. (Local requirements may not allow the disposal of asbestos waste in drums. Check with appropriate agency and institute appropriate alternative procedures.)

C. Waste containers shall be placed on the ground at the disposal site, not pushed or thrown out of trucks (weight of wet material could rupture containers).

D. Personnel off-loading containers at the disposal site shall wear protective equipment consisting of disposable head, body, and foot protection and, at a minimum, half-face piece, air-purifying, dual cartridge respirators equipped with high efficiency filters.

E. Following the removal of all containerized waste, the truck cargo area shall be decontaminated using HEPA vacuums and/or wet methods to meet the no-visible residue criteria. Polyethylene sheeting shall be removed and discarded along with contaminated cleaning materials and protective clothing, in bags or drums at the disposal site.

F. If landfill personnel have not been provided with personal protective equipment for the compaction operation by the land-fill operator, Contractor shall supply protective clothing and respiratory protection for the duration of this operation.

END OF SECTION

SECTION 02 8087

ASBESTOS ABATEMENT RESTORING THE WORK AREA AND SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Cleaning Up: Section 02 8090

B. Restoring of the work area to pre-abatement condition shall only occur following the completion of clean-up procedures and after clearance air monitoring has been performed and documented to the satisfaction of the Owner.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 REESTABLISHMENT PROCEDURES

A. The Contractor and Owner shall visually inspect the work area for any remaining visible residue. Evidence of contamination will necessitate additional cleaning.

B. Additional air monitoring shall be performed if additional clean-up is necessary.

C. Following satisfactory clearance of the work area, remaining polyethylene barriers may be removed and disposed of as asbestos-contaminated waste.

D. At the discretion of the Owner, mandatory requirements for personal protective equipment may be waived following the removal of all barriers.

E. Re-secure mounted objects removed from their former positions during area preparation activities.

F. Relocate objects that were removed to temporary locations back to their original positions.

G. Repair areas of damage that occurred as a result of abatement activities and as indicated.

END OF SECTION

SECTION 02 8090

ASBESTOS ABATEMENT CLEANING UP

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Regulatory Requirements: Section 02 8071
   2. Restoring the Work Area and Systems: Section 02 8087
   3. Cleaning for Specific Products or Work: The respective sections of the specifications.

B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by operations.

C. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

1.02 SAFETY REQUIREMENTS

A. Standards: Maintain project in accordance with safety and insurance standards and the specifications contained herein.

B. Hazards Control
   1. Remove asbestos waste from premises daily.
   2. Prevent accumulation of wastes which create hazardous conditions.
   3. Provide adequate ventilation.

C. Conduct cleaning and disposal operations to comply with federal, state, and local ordinances.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

A. Clean the Worker Decontamination Unit at least once each shift.

B. Clean the area near the Waste Decontamination Unit and the Worker Decontamination Unit at least once each shift.

3.02 FINAL CLEANING

A. Employ experienced workmen or professional cleaners for final cleaning.

B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.

D. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.

E. Broom clean paved surfaces; rake clean other surfaces of grounds.

F. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs on grade.

C. Concrete foundation walls and footings.

D. Concrete reinforcement.

E. Joint devices associated with concrete work.

F. Concrete curing.

G. Ramps.

H. Finishes.

I. Mix design.

J. Vapor Retarder.

K. Concrete materials.

L. Placement procedure.

M. Field Quality Control.

1.3 RELATED REQUIREMENTS

A. Section 01 4533 - Code-Required Special Inspections and Procedures.

B. Section 05 5213 - Pipe and Tube Railings.

C. Section 07 2100 - Thermal Insulation for under slab

D. Section 31 2316 - Excavation for drainage fill under slab-on grade, stairs, and ramps.

E. Section 32 1313 - Concrete Paving and Curbs.

1.4 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

D. ACI 303 "Guide to Cast-in-Place Architectural Concrete Practice."

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

F. ACI 305R - Guide to Hot Weather Concreting; 2010.

G. ACI 306R - Guide to Cold Weather Concreting; 2016.

H. ACI 308R - Guide to External Curing of Concrete; 2016.

I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).

J. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

K. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2017.

L. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

M. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.

O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.

P. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

Q. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.

R. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.

S. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

T. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

U. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.

V. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.

W. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2015.

X. CRSI Manual of Standard Practice.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions for each product indicated.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, 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.
   1. Include foundation plans and elevations.
   2. Indicate all penetrations and sleeve location and reinforcing.
   3. Identify areas of exposed surfaces and finish.

D. Mix Design: Submit proposed concrete mix design with NY State PE seal and signature.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
   3. Indicate amounts of mixing water to be withheld for later addition at Project site.

E. Samples: Submit samples of underslab vapor retarder to be used.

F. Test Reports: Submit report for each test or series of tests specified.

G. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

H. Qualification Data: For installer and concrete supplier.

I. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
   1. Material Certificates: For each of the following, signed by manufacturers:
      a. Cementitious materials.

b. Admixtures.
c. Form materials and form-release agents.
d. Steel reinforcement and accessories.
e. Curing compounds.
f. Bonding agents.
g. Joint-filler strips.

J. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.6 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. Manufacturer/Supplier Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

E. Installer Qualifications: The work of this section shall be performed by a qualified installer, with a minimum of five (5) years experience, approved by the Owner's Representative. The term “installer” used herein, shall mean a firm of established reputation which is regularly engaged in and which maintains a regular force of workmen skilled in the installation of the type of work specified in this section.

F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

G. Concrete Testing Service: Refer to Section 01 4000 - Quality Requirements.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements.-
1. 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. Concrete subcontractor.

I. Delivery Records: Each delivery to the site of concrete shall be accompanied by weigh master's certification. Retain all copies for inspection by the Testing Agency.
1. Indicate water added to mix a job site on each delivery ticket. Show quantity of water added. Site water tempered mixes exceeding specified slump range will be rejected as not complying with specification requirements

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals..

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials so as to preserve their quality and fitness for work.

B. Store reinforcement and formwork in manner to prevent bending, damage (including damage to coatings), and accumulation of dirt.

C. All packed materials shall be delivered to the site in original unopened containers, clearly indicating manufacturer's name, brand name, and other identifying information.

1.9 PROJECT CONDITIONS

A. Coordinate with the work of all other sections and/or separate contracts.

PART 2 PRODUCTS

2.1 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

1. Form Facing for Exposed Finish Concrete: Plywood, metal, metal-framed/plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown in drawings. .
    a. Material:
        a) Plywood materials shall be one of the following:
            (a) Overlaid plywood complying with U.S. Product Standards PS 1 "A-C or B-B High Density Overlaid (HDO) Concrete Form," Class 1, exterior grade or better.
            (b) Plywood complying with U.S. Product Standard PS 1 "B-B (Concrete Form) Plywood," Class 1, exterior grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
2. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings, maximum VOC of 450 g/l that will not bond with, stain, or adversely affect concrete surfaces or impair subsequent treatments of concrete surfaces requiring bond or adhesion or impede wetting of surfaces to be cured with water or curing compound.
    a. Formulate form release agent with rust inhibiter for steel form-facing materials
4. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off, metal form ties, designed to prevent form deflection and spalling concrete upon removal. Provide units that will leave no metal closer than 1 inch to exposed surface.
    a. Provide ties that will leave holes no larger than 1-inch diameter in concrete surface when removed.
    b. Provide galvanized or stainless-steel ties for concrete elements that are reinforced with epoxy-coated or galvanized reinforcing.
    c. Internal wood spreaders are prohibited

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).

1. Finish: Epoxy coated in accordance with ASTM A775/A775M, unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): Class A epoxy coated, deformed type, ASTM A884/A884M.

1. Form: Flat Sheets.
2. Mesh Size: 6 x 6.
3. Wire Gage: W 6 x W6.

C. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
    a. Supports for epoxy-coated reinforcing shall be either wire bar-type coated with epoxy, plastic, or vinyl compatible with concrete for a minimum distance of 2 inches from the point of contact with reinforcing or all plastic-type.
3. Finish (epoxy-coated or galvanized) for supports formed from reinforcing bars shall match the finish of the supported reinforcing.

4. Provide stainless steel or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.
5. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
1. Acquire aggregates for entire project from same source.
2. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps, or other deleterious substances.
3. Coarse Aggregate: Clean, uncoated, processed aggregate free from clay, mud, loam, or foreign matter.
4. Gradations:
a. For footings, foundation walls, piers, grade beams, basement walls, retaining walls, and interior walls:

Sieve Size	Percent Passing
2 inch	100
1-1/2 inch	95 to 100
3/4 inch	35 to 70
3/8 inch	10 to 30
No. 4	0 to 5

b. For Slabs on Grade:

Sieve Size	Percent Passing
1 inch	95 to 98.5
3/4 inch	75 to 94
1/2 inch	25 to 50
3/8 inch	10 to 25
No.4	0 to 10

C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.4 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. Water Reducing Admixture: ASTM C494/C494M **Type A**.

2.5 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
2. Manufacturers:
a. "Griffolyn T-65G" by Reef Industries In, three-ply, nylon- or polyester-cord-reinforced, high-density polyethylene sheet; laminated to a nonwoven geotextile fabric, 30 mils (0.76 mm) thick..
b. Substitutions: See Section 01 2500 Substitution Procedures.

B. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.

1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
    a. Maximum Height Change: Plus 4 percent.
    b. Minimum Height Change: Plus 1 percent.

2.6 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application.
2. Manufacturers:
    a. Euclid Chemical Company: www.euclidchemical.com.
    b. Dayton Superior Corporation: www.daytonsuperior.com.
    c. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
    d. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
    e. Substitutions: See Section 01 2500 Substitution Procedures..

B. Slab Isolation Joint Filler: 1/4 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
1. Material: ASTM D1751, cellulose fiber.
2. Manufacturers:
    a. W. R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap: www.wrmeadows.com.
    b. Substitutions: See Section 01 2500 Substitution Procedures.

C. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
2. Height: To suit slab thickness.
3. Manufacturers:
    a. Vinylex, Knoxville, TN 37921 (615) 690-2211.
    b. Substitutions: See Section 01 2500 Substitution Procedures..

2.7 CURING MATERIALS

A. Moisture-Retaining Sheet: ASTM C171.
1. Polyethylene film, clear, minimum nominal thickness of 4 mil, 0.004 inch.

B. Water: Potable, not detrimental to concrete.

2.8 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, 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 (3 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Concrete Patching and Repair: One-component, early strength gaining, cementitious, patching material.
1. Flexural Strength (ASTM C-293): 28 days 850 psi.
2. Splitting Tensile Strength (ASTM C-496): 28 days 550 psi.

3. Bond Strength (ASTM C-882 modified): 28 days 1,800 psi.
4. Compressive Strength (ASTM C-109): 28 days 7,000 psi.
5. Color Concrete gray
6. Manufacturers:
   a. Acceptable Products: SilkaRepair 223
   b. Substitutions: See Section 01 2500 Substitution Procedures..

2.9 CONCRETE MIX DESIGN

A. Proportioning Normal and Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.

B. Identify sources of all products used in design mixes.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
   2. Water-Cement Ratio: Maximum 0.45.
   3. Total Air Content: 6 percent, determined in accordance with ASTM C173/C173M.
   4. Maximum Slump: 4 inches.
   5. Provide batch ticket for each batch discharged and used in work indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

2.10 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

2.11 REINFORCING FABRICATION

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Fabricate bars to required lengths, shapes, and bends. Do not rebend or straighten reinforcement in manner that could weaken material.

2.12 FINISHES

A. "Rapid Set WunderFixx" as manufactured by CTS Cement Manufacturing Corporation, www.ctscement.com <http://www.ctscement.com> or approved equal.
   1. Use for finishing all exposed concrete vertical surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

B. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347 and ACI 117.

C. Verify that forms are clean and free of rust before applying release agent.

D. Clean and coat forms before erection. Do not coat forms in place.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, etc., for easy removal.

F. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

G. Chamfer exposed corners and edges as indicated using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

H. Fit corners and joints with gaskets or tape to prevent leakage.

I. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

J. Sleeves: Provide sleeves in concrete formwork for plumbing, electrical, and mechanical penetrations. Coordinate size and location of sleeves with Contractors and mechanical, electrical, and plumbing drawings.
   1. Accurately place and secure in forms.
   2. Coordinate sleeve locations with reinforcing bars.

K. Penetrations shall not occur through footings, piers, columns, beams, joists, grade beams, or supported slabs unless shown in structural drawings

L. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

M. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

N. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement

B. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

C. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

D. Place slab reinforcing one-third of slab thickness below top surface of slab. Support reinforcement by metal chairs, runners, bolsters, or concrete brick as required.
   1. Dedicate workers to placement of reinforcement to continuously monitor and adjust reinforcement location during concrete placement.

E. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

F. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

G. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

H. Comply with manufacturer-recommended procedures for installing and anchoring of doweled reinforcement using chemical adhesives, including drilling and cleaning of holes and mixing and applying of adhesives.

I. Coordinate placement of reinforcement with openings, including sleeves and other embedded items. Where one or more bars are interrupted, provide additional reinforcement at openings. Additional reinforcement is noted in drawings.

J. Use of nails in forms and use of clay brick to support reinforcement is prohibited.

3.4 WATERPROOF MORTAR

A. Install as per manufacturer's instructions.
   1. Apply at all junctions of slab on grade and vertical foundation walls.

3.5 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Notify Owner's Representative not less than 24 hours prior to commencement of placement operations.

C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

D. Ensure reinforcement and formed construction joint devices will not be disturbed during concrete placement.

E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
   1. Slabs on Grade: Use strip pour methods and mechanical vibratory screed whenever possible.
   2. Deposit and consolidate concrete in continuous operation within limits of construction joints until placing of panel or section is complete.
   3. Consolidate concrete during placing operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   4. Bring slab surfaces to correct level with a straightedge and strike off. Uniformly slope to drains. Use darbies to smooth surface, leaving it free of humps or hollows. Do not sprinkle water or portland cement on plastic surface. Do not disturb slab surfaces before beginning finishing operations.
   5. For floor areas with drains, Contractor shall be responsible for finishing concrete slabs to proper elevations to ensure surface moisture will drain freely to floor drains and no puddle areas exist. Reference elevations shown in drawings.

F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

G. Do not use vibrators to transport concrete inside formwork.

H. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Vibrators shall penetrate placed layer of concrete at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set.

I. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

J. Do not allow vibrator to come in contact with form.

3.6 SLAB JOINTING

A. Locate joints as indicated on drawings or as recommended by ACI 302.

B. For placement of slabs that will be subsequently concealed with an architectural finish material place slabs with few construction joints or as recommended by ACI 302.

C. Anchor joint fillers and devices to prevent movement during concrete placement .

D. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
   2. Place joint filler in floor slab pattern placement sequence. Set top to required elevations.
   3. Install joint devices in accordance with manufacturer's instructions.

4. Apply sealants in joint devices in accordance with Section 07 9200 - Joint Sealants.

E. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

F. Hand tooled or Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

3.7 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Equipment Bases and Foundations: Provide machine, locker and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

C. Stair Nosing: Examine substrates, supports, and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work

1. Strictly comply with manufacturer's instructions and recommendations and approved details. Securely anchor work to substrate.
2. Repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired

3.9 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:

1. Preparation:
   a. Mechanically remove loose, unsound, contaminated concrete.
   b. Concrete must be free of materials such as paint, oil, curing compound, bond breaker, etc. that will inhibit bonding.
   c. Thoroughly clean extraneous material such as dirt, loose chips, and dust from concrete surface. If compressed air is used, it shall be free of oil.
   d. Concrete surface shall be dry
2. Mixing:
   a. Use 1 part water to 2 parts of material.
   b. Mixed material should have a temperature of about 70°F. Warmer material will set faster than expected and cooler material will have slower strength gain. Control the mixed temperature by protecting the bags of repair material from temperature extremes and adjust the mixed temperature by using hot or cold water.
   c. Add potable water first then add material while mixing mechanically with a drill and mixing paddle.
   d. Do NOT add any other admixtures. Do NOT add sand, aggregate, or cement.
   e. Mix until smooth, uniform, and lump-free (usually 3 to 5 minutes).
   f. Do NOT re-temper.
   g. Clean mixing bucket and tools between batches.
3. Placement:
   a. Place material onto the dry substrate.

b. Maintain surface and ambient temperature between 45°F and 100°F during and for 4 hours after placement.
c. Protect adjacent surfaces with drop cloths, waterproof paper, or other means to maintain them free of material splashes, water, and debris.
d. Place material immediately after mixing.
e. Apply material in one pass and avoid re-troweling.
f. As the material becomes stiff (usually 10 to 20 minutes) use a trowel to shave or cut the material to the desired shape.
g. Sanding may be begun as soon as material has dried and must be completed within 24 hours.

4. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

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.

E. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:

1. Surfaces to Receive Thick Floor Coverings: "Scratch" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include exposed to view, resilient flooring, and thin set ceramic tile.
   a. 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.
3. Broom Finish: Apply a broom finish to exterior sidewalks, concrete platforms, steps, and ramps, and elsewhere as indicated.
   a. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Owner's Representative before application.
4. Surfaces to Be Left Exposed: Steel Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
   a. Chemical Hardener: After slab has cured, apply water-diluted hardener in three coats per manufacturer's instructions, allowing 24 hours between coats.
5. Screed floors level, maintaining the following minimum F(F) Floor Flatness and F(L) Floor Levelness values when measured in accordance with ASTM E 1155/ASTM E 1155M.
   a. F(F): Specified Overall Value (SOV) of 35; Minimum Localized Value (MLV) of 24.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.10 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

1. Normal concrete: Not less than seven days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

3.11 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design to testing firm for review prior to commencement of concrete operations.

D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

G. Permeability Test: Test concrete with waterproofing admixture according to COE CRD-C 48.

H. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

3.12 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Owner's Representative and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Owner's Representative. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Owner's Representative for each individual area.

3.13 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 03 5400
CAST UNDERLAYMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.
   1. Use cementitious type at all locations.

1.3 RELATED REQUIREMENTS

A. Section 01 7000 - Execution: Alteration project procedures; selective removals for remodeling.

B. Section 09 6500 - Resilient Flooring for flashing patching.

C. Section 09 3000 - Tiling.

1.4 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 C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2018.

C. ASTM F-2170 Relative Humidity in Concrete.

D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, 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. Manufacturer's Instructions.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results of underlayments for compliance with requirements indicated.

E. Minutes of preinstallation conference.

F. Submit certification, in writing by the finish floor manufacturer that the Cast Underlayment is compatible and acceptable for their product,

1.6 QUALITY ASSURANCE

A. Manufacturer: Provide underlayment manufactured by a firm with a minimum of ten (10) years experience with types equivalent to those specified.
   1. Manufacturer capable of providing technical training and field service representation.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years of experience who has completed work similar in material, design, and extent to that indicated for this Project and approved by the manufacturer.

C. Testing Agency Qualifications: An independent testing agency, acceptable to Owner’s Representative and Architect, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section 01 3000 - Administrative Requirements.

E. Product must have a hydraulic cement-based inorganic binder content as the primary binder which includes portland cement per ASTM C150: Standard Specification for Portland Cement and other specialty hydraulic cements. Gypsum-based products are not acceptable.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products in a dry area with temperature maintained between 50° and 85°F (10° and 29°C) and protect from direct sunlight

C. Handle products in accordance with manufacturer's printed recommendations

1.8 MOCK-UP

A. Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Prepare mock-up in location designated by Owner's Representative.
   2. Area: 6 ft by 6 ft.
   3. Do not proceed with underlayment work until workmanship of mock-up has been approved by Owner's Representative
   4. If Owner's Representative determines that mockups do not meet requirements, demolish and remove them from the site and cast others until mockups are approved.
   5. Mock-up may remain as part of the Work.

1.9 FIELD CONDITIONS

A. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting underlayments performance.

B. During the curing process, ventilate spaces to remove excess moisture.

C. Close areas to traffic during underlayments application and, after application, for time period recommended in writing by manufacturer

1.10 WARRANTY

A. Provide manufacturer's comprehensive ten)10) year warranty.
   1. Verify material is acceptable with adhesives use with finish floor systems.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cementitious Underlayment: Basis of Design:
   1. ARDEX Engineered Cements; ARDEX K 15 with ARDEX P51 Primer: www.ardexamericas.com.
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 MATERIALS

A. Cast Underlayments, General:
   1. Comply with applicable code for combustibility or flame spread requirements.
      a. Refer to Section 01 4100 - Regulatory Requirements.

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 5,5000 pounds per square inch after 28 days, tested per ASTM C109/C109M.
   2. Flexural Strength: Minimum 1200 psi after 28 days, tested per ASTM C348.
   3. Shrinkage: 0.025 - 0.045% @ 28 days when tested in conformance with ASTM C 531 (modified).
   4. Ideal Slump range 11.5" - 12.5" (2" diameter pipe, 4" high).
   5. Bond Strength: 350-400 psi when tested in conformance with ASTM D 3931
   6. "0" VOC content
   7. Final Set Time: 2 to 3hour.
   8. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch.
   9. 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 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: Ardex P 51

G. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

2.3 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Mix using a ½" (12 mm) heavy-duty drill (min. 650 rpm) with an mixing paddle. Do not over water. When mixing sanded materials, follow manufacturer's recommendations, or use a standard "gutter hook" vacuum attachment in combination with a wet/dry (Shop-Vac® style) vacuum and HEPA dust extraction vacuum system. Additionally, each bag should be handled with care and emptied slowly to avoid creating a plume of dust. Contact the manufacturer's Technical Service Department for more details on products and air quality management.

C. Aggregate mix: For areas to be installed over 1 ½" (4 cm) thick, aggregate may be added to reduce material costs. Mix Underlayment with water first, then add 1 part aggregate by volume of washed, well-graded 1/8" to 3/8" (3 to 9.5 mm) pea gravel. The aggregate size must not exceed 1/3 the depth of the pour. Do not use sand. Note: The addition of aggregate will diminish the workability of the product and may make it necessary to install a finish coat to obtain a smooth surface. Allow the initial application to dry for 12 to 16 hours, and then prime this layer with primer mixed 1: 1 with water. Allow the primer to dry (min. 30 minutes, max. 24 hours) before installing the neat coat of underlayment

D. For pump installations, underlayment shall be mixed using the Automatic Mixing Pumps. recommended by the manufacturer Contact the manufacturer's Technical Service Department for complete pump operation instructions.

E. Mix to self-leveling consistency without over-watering and in accordance with manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test moisture content of substrates:

1. Per ASTM F2170, do not install if relative humidity is > 95% (15 pounds per 1000 sq. ft. per 24 hours ASTM F1869) up to and including 98% Relative Humidity (20 pounds per 1000 sq. ft. per 24 hours ASTM F 1869) without first applying TEC® The LiquiDAM® moisture mitigation membrane.
   a. Cost of mitigation testing shall be included in the Contractor's proposal.
2. For moisture sensitive floor finishes refer to the finish floor manufacturers specifications for moisture limitations. Remediation of excessive moisture conditions **must be done prior to** installation of Self Leveling Underlayment. To reduce moisture vapor emissions to an acceptable level, use material recommended by the manufacturer.
3. Refer to finish flooring systems for additional requirements.

B. Notify the Owner's Representative and Architect in writing of any unsatisfactory conditions.

C. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch

1. After profiling test substrate by place drop of water, or other means to insure all coatings, sealers etc have been removed. Repeat profiling if necessary.
2. Prepare and clean existing base slabs according to topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
3. Mechanically remove contaminants from existing concrete that might impair bond of topping.
4. Saw cut existing contraction and construction joints to a depth of 1/2 inch and fill with epoxy joint filler.

B. Install joint-filler strips where topping abuts vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

C. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

D. Vacuum clean surfaces.

E. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

F. Close former roof and floor openings where items and equipment have been removed and as indicated..

G. Close floor openings.

3.3 APPLICATION OF PRIMER

A. Install products in accordance with manufacturer's instructions.

B. Prime standard subfloors with manufacturer's recommended solvent-free primer.
1. Mix Primer 1:1 with water and apply evenly with stiff bristled push broom.
2. Apply an even continuous coat.
3. Allow to dry to a clear film (typically 30 minutes; maximum 24 hours).
4. Do not apply underlayment until the primer is dry.
   a. To determine if the primer is dry after a minimum of 30 minutes (max. 24 hours), pour water onto the surface of the primer in several areas and rub it with your finger. If the water remains clear, the primer is dry. If the water turns cloudy or milky, additional drying time is needed.
5. Primer coverage is approximately 400 to 450 sq. ft. per gallon depending on surface texture.
6. Prime extremely absorbent subfloors twice.

3.4 APPLICATION OF UNDERLAYMENT

A. Existing Concrete: Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch, without puddling. Place topping while adhesive is still tacky

B. Install underlayment in accordance with manufacturer's instructions.

C. 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.

D. Place to required thickness, with top surface level to 1/16 inch in 10 ft.

E. For final thickness over 1-1/2 inches, 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.

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. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of topping, at locations indicated or as approved by Owner’s Representative.
1. Coat face of construction joint with epoxy adhesive at locations where topping is placed against hardened or partially hardened topping.

H. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before topping develops random contraction cracks.
   1. Form joints in topping over contraction joints in base slabs, unless otherwise indicated.
   2. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.
   3. Construct contraction joints for a depth equal to one-half of topping thickness, but not less than 1/2 inch deep

I. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

3.5 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.

Underlayment can be walked on in 2-3 hours. Moisture-insensitive tiles such as ceramic, quarry and porcelain can be installed after 6 hours. All other finish floor coverings can be installed after 16 hours at 70°F (21°C). For resinous systems such as epoxy and polyurethane floors please contact the manufacturer's Technical Services Department.

3.6 JOINT FILLING

A. Prepare and clean contraction joints and install epoxy joint filler, according to manufacturer's written instructions, once topping has fully cured.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install epoxy joint filler full depth of contraction joints. Overfill joint and trim joint filler flush with top of joint after hardening

3.7 FIELD QUALITY CONTROL

A. An independent testing agency will perform field inspection and testing, as specified in Section 01 4000 - Quality Requirements.

3.8 REPAIRS

A. Defective Topping: Repair and patch defective topping areas, including areas that have not bonded to concrete substrate

3.9 PROTECTION

A. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 04 0100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Dust control.

B. Removal and rebuilding of exterior masonry units where indicated on drawings.

C. Salvaging and re-using existing brick units.

D. Mortar.

E. Refurbishing of existing lintels.

F. Moisture resistant gypsum board.

G. Cavity-wall insulation

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts for Sequence of Work

B. Section 01 2000 - Price and Payment Procedures

C. Section 01 5000 - Temporary Facilities and Controls

D. Section 06 1000 - Rough Carpentry

E. Section 07 5010 - Modifications to Existing Roofing

F. Section 07 5323 - EPDM Roofing

G. Section 07 6200 - Sheet Metal Flashings & Specialties

H. Section 07 7200 - Roof Accessories

I. Section 07 9200 - Joint Sealants

J. Section 09 9113 - Exterior Painting

1.4 REFERENCE STANDARDS

A. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

B. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

C. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2008.

D. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.

E. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

F. New York State Parks, Recreation & Historic Preservation Brief #2 Guidelines.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene two weeks prior to commencing work of this section.

1. Require attendance of parties directly affecting work of this section.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements or submittal procedures.

B. Product Data: Provide data on all material, including recommended installation procedures.

C. Samples: Submit four samples of face brick units to illustrate matching color, texture and extremes of color range.
   1. For each type of mortar provide 6 inch long by 1/2 inch wide sample strips set in metal or plastic channels.
   2. Each type of anchor

D. Manufacturer's Instructions: For cleaning materials, indicate special procedures, conditions requiring special attention.

E. Test reports and certifications substantiating compliance with specification requirements.

F. Material Safety Data Sheets.

1.7 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Qualification: The sub-contractor with a minimum of five years experience, experienced 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.
   1. The Installer shall directly employ the personnel performing the work of this section
   2. The Installer shall have a full time supervisor/foreman on the roof when roofing work is in progress. The Supervisor shall have a minimum of 5 years experience in roofing work similar in nature and scope to this project, and speak fluent English
   3. Submit a reference list which shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.

C. The Installer shall provide a reference list of at least three (3) projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner:

D. 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.

E. Pre-Work Conference: Attend the pre-roofing meeting and discuss the following:
   1. How masonry work will be performed and coordinated with other work.
   2. How the building will be kept watertight as masonry work progresses.
   3. The construction schedule, forecast weather, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
   4. A schedule for Manufacturer and rchitect inspections.

1.8 MOCK-UP

A. Provide mock-up of existing opening include in mock-up area instances of brick, mortar, flashings, repointiing, and accessories.

B. How flashings will be built into the masonry.

C. Clean a 5 ft by 2 ft panel of wall to determine extent of cleaning.
   1. Repeat, using different cleaning methods for up to three different panels.

D. Locate where directed.

E. Mock-up may remain as part of the Work.

F. Allow samples to cure at least three days (or longer, if possible) before obtaining Architect or Construction Manager's approval for color match. Mortar colors will continue to lighten as they cure and are exposed to the weather, so samples should be installed as far in advance as possible. Samples should be viewed from a minimum distance of 12 feet.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Carefully pack, handle, and ship masonry units and accessories strapped together in suitable packs or pallets or in heavy cartons.

B. Deliver material to the site in the Manufacturer's original and unopened containers and packaging, bearing labels which identify the type and names of the products and Manufacturers. Unload and handle to prevent chipping and breakage.

C. Protect masonry materials and aggregates during storage and construction from excess wetting by rain, snow or ground water, and from staining or inter mixture with earth or other types of materials.

D. Protect grout, mortar and cement products from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Protect liquid components from freezing.

E. Do not overload the structure when storing materials on he roof.

1.10 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

C. Repoint mortar joints and repair masonry only when air temperature is between and 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of work.

D. Erect temporary covers over pedestrian walkways and at building entrances and exits which will remain active as the work progresses.

E. Prevent mortar from staining the face of surrounding masonry and other building surfaces, immediately remove any which falls or spills. Protect sills, ledges and projections from mortar droppings.

F. Coordinate masonry removal and restoration with the installation of new metal and membrane flashings

1.11 GUARANTEE

A. Provide a Contractor's written Guarantee which warrants that all work will remain free of material and workmanship defects and in a watertight condition for a two year period beginning upon Final Completion:

1. Defective work includes but is not limited to the following types of failure: leakage, delamination, lifting, loosening, splitting, cracking, and undue expansion.
2. The Contractor's Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense:
3. The Guarantee shall include the removal and replacement of items or materials installed as part of the original work, if removal is needed to affect guaranteed repairs.
4. For roof related masonry provide a written Contractor's Guarantee which guarantee that all work will remain free from material and workmanship defects and in a waterdtight condition for a five year perio

B. The Contractor's Guarantee shall be issued no more than 30 days before the satisfactory completion of punch list work.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS

A. Cleaning Agent: Acid solution type.

2.2 MORTAR MATERIALS

A. At Contractor's option, mortar and grout may be made from factory premixed dry materials with addition of water only or ready-mixed.

B. Mortar Color: Match existing.

C. Mortar Mix Designs: ASTM C270, Property Specification.

1. Type N for setting mortar.
2. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

2.3 MASONRY MATERIALS

A. Brick shall be clay or shale, ASTM C216, Type FBS , solid. Brick shall be tested for efflorescence in accordance with ASTM Test Methods C67 and the rating shall be ”Not Effloresce”.
   1. Use 100% solid brick over exterior relieving angles/lintels or other brick projections on exterior face of building. (Use of solid brick with cores is acceptable if cores are filled solid with mortar and the cores are not visible to view.

B. Face Brick and Accessories: Provide face brick and accessories, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.

C. Provide units with colors, surface texture, and physical properties to match existing units in size and shape.
   1. For sample that exhibits a range of colors, provide brick that matches that range rather than brick that matches an individual color within that range.

2.4 MASONRY ANCHORS

A. All reinforcement and anchors located in exterior walls shall be stainless steel.

B. Anchors: Type and size indicated, or if not indicated, to match existing in size and type. Fabricate anchors and dowels from Type 302 or Type 304 stainless steel.

C. Strap Anchors: Bent steel shapes configured as required for specific situations, 1/-1/2 in width, 0.105 in thick, lengths as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face, corrugated for embedment in masonry joint, stainless steel.
   1. Length: Verify in field.
   2. Hohmann & Barnard weld on ties #345.

D. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.

E. Restoration Anchors: Friction Pinning Anchor for anchoring existing brick to backup masonry, stainless steel, 5/16" x 7-3/4".
   1. #DA508 by Duro-Wall Masonry Accessories.

F. Multiple Wythe Joint Reinforcement: Truss type; fabricated with moisture drip; stainless steel wire conforming to ASTM A580/A580M Type 304; 0.1875 inch side rods with 0.1875 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure. Flush weld all keys.
   1. Hohmann & Barnard - #130.

2.5 ACCESSORIES

A. Sealant Refer to Section 07 9200 - Joint Sealants

B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
   1. Mortar Diverter: Panels designed for installation at flashing locations.
      a. Manufacturers:
         a) Mortar Net USA, Ltd; Mortar Net with Insect Barrier: www.mortarnet.com.
         b) Substitutions: See Section 01 2500 Substitution Procedures.

C. Weeps: Cellular, honeycomb design, polypropylene weep vents for embedding in masonry wall mortar joints;
   1. Material: High density polyethylene and impervious to water and resistant to UV degradation.

2. Hohmann & Barnard, Inc. #QV - Quadro-Vent.

D. Paint: Refer to Section 09 9113 - Exterior Painting.
1. Refer to Finish schedule.

2.6 EMBEDDED FLASHING MATERIALS

A. Sheet Copper Flashing: Type: 5 layers, flexible flashing consisting of copper sheet bonded on both sides to asphalt coated glass fabric; Advanced Copper Fabric as manufactured by Advanced Building Products, Inc.
1. Characteristics: Waterproof, flexible, high tensile strength, resistant to mortar acid and alkali action, allowing minimum thermal cold flow through structure, and textured surface promoting mortar joint bonding.
2. Flashing mastic: Fibrated, trowel grade mastic consisting of asphalt, mineral stabilizers, and complying with ASTM D2822, Type 1; Cop-R-Tite Flashing Mastic as manufactured by Advanced Building Products, Inc.

2.7 MORTAR MIXES

A. Comply with ASTM C 270, Proportion Specification
1. Setting mortar, use Type N.
2. Brick Replacement Mortar: Type S .
3. Pointing mortar Type N.
a. Verify strength of existing mortar. New mortar shall not exceed strength of existing mortar.

B. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match existing.

C. 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 retemper or use partially hardened material

D. Do not use admixtures of any kind in mortar, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces to be cleaned are ready for work of this section.

3.2 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Separate areas to be protected from restoration areas using means adequate to prevent damage.

C. Cover existing landscaping with tarpaulins or similar covers.

D. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures, including:
1. Windows.
2. Soft joints and sealants.
3. Door frames.
4. Vents, louvers and grills

E. Close off adjacent occupied areas with dust proof partitions.

F. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

G. Do not allow cleaning runoff to drain into sanitary or storm sewers.

3.3 BRICK REMOVAL AND REPLACEMENT

A. Carefully remove bricks on a piece by piece basis. Cut out full units from joint to joint and to permit replacement with full size units. Clean the edges of remaining bricks, to remove all mortar, dust, and loose debris in preparation for rebuilding

B. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

C. Simultaneously remove limited sections of existing masonry; support and protect masonry remaining next to and above the removal areas

D. Support structure as necessary in advance of cutting out units.

E. The Contractor is responsible for performing Work in a safe manner. Provide temporary shoring or other supports as required to prevent displacement of existing masonry that is to remain. Perform the removal Work with such care as may be required to prevent failure of the masonry or damage to adjoining masonry that is to remain

F. Cut away loose or unsound adjoining masonry and mortar as directed. Do not use impact type tools, use only rotary type grinders.

G. Use power tools only after test cuts determine no damage to masonry units will result. Provide vacuum attachment for all grinding/cutting equipment for dust control purposes.

H. Do not damage masonry units.

I. Build in new units following procedures for new work. .

J. Ensure that anchors, ties, reinforcing, and flashings are correctly located and built in.

K. Install new cap flashings, and wall flashing extensions, properly connected to the existing wall flashings, as indicated on the drawings and specified elsewhere before installing new bricks

L. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings. Use a motor driven diamond blade saw to cut bricks with clean, sharp, unchipped edges.

M. Install through wall flashings properly connected to the existing wall as indicated. before installing the new bricks

N. Wet brick which have initial rates of absorption (suction) of more than 30 grams per 30 square inches per minute, (in accordance with ASTM C 67), to ensure the bricks are nearly saturated with water, but surface dry when laid

O. 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 g/30 sq. in. per min.. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid. Maintain joint width for replacement units to match existing joints.

P. 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

Q. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brick work

3.4 LINTEL RESTORATION

A. Wire or power brush all exposed surfaces.

B. Provide prime coat and two finish coats of paint.

3.5 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing.

3.6 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.7 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Lap joint reinforcement ends minimum 6 inches.

3.8 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Install horizontal joint reinforcement 16 inches on center.

B. Place continuous joint reinforcement in first and second joint below top of walls.

C. Lap joint reinforcement ends minimum 6 inches.

D. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.9 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

3.10 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 8 inches to form watertight pan at non-masonry construction.
   2. Seal lapped ends and penetrations of flashing before covering with mortar.

3.11 GENERAL CLEANING AND PROTECTION PROCEDURES

A. Protect persons and surrounding surfaces of building being restored 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.
   2. Comply with 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 pedestrians, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
   3. 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.
   4. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures, including:
      a. Windows.
      b. Soft joints and sealants.
      c. Door frames.
      d. Vents, louvers and grills

5. Keep wall wet below area being cleaned to prevent streaking from runoff.
6. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
7. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
8. 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.

B. 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

C. Apply all material in strict accordance with the manufacturer's instructions.

D. Protect people, vehicles, property, plants, non masonry surfaces from product splash, residue, wind drift and fumes.

E. Do not apply when surface and air temperature falls below 50 degrees.

3.12 CLEANING NEW BRICK MASONRY

A. Test surface for cleaning effectiveness.

B. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.

C. Protect area below cleaning operation and keep masonry soaked with water and flushed free of acid and dissolved mortar continuously for duration of cleaning.

D. Before solution dries, rinse and remove acid solution and dissolved mortar, using clean, pressurized water.
1. Apply 400-1000 psi pressure, water flow rate of 6-8 gallons per minute, to masonry surfaces , maintaining uniform depth and surface texture throughout. Use 15-45 degree fan spray. If required heat water to 150-180 degree.
2. Let dwell 3 to 5 minutes. Do not let let cleaner dry on the surface. Fresh water rinse the surfaces below areas being cleaned to prevent streaking.
3. Repeat steps as required

3.13 FIELD QUALITY CONTROL

A. Inspectors: Owner may engage qualified inspectors to perform inspections and prepare test reports. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Notify Construction Manager in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

3.14 CLEANING

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Clean surrounding surfaces.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Concrete Masonry Units (CMU).

B. Clay facing brick.

C. Common brick.

D. Reinforcement and anchorage.

E. Flashings.

F. Accessories.

1.3 RELATED REQUIREMENTS

A. Section 05 4000 - Cold Formed Metal Framing

B. Section 05 5000 - Metal Fabrications: Loose steel lintels.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

D. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

E. Section 08 9100 - Louvers for louvers set in masonry

1.4 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2018

B. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

D. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2016.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision (2018).

F. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016.

G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

H. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2017.

I. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2018.

J. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.

K. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.

L. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2017a.

M. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

N. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

O. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

P. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

Q. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

R. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting two (2) weeks before starting work of this section; require attendance by all relevant installers.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, all masonry accessories, and anchors.

1. Material Data: Submit to Architect certificates for the following signed by manufacturer and Contractor certifying each material complies with requirements.
    a. Masonry Units.
    b. Each different cement product required for mortar and grout, including name of manufacturer, brand, and type.
    c. Each material and grade indicated for reinforcing bars.
    d. Each type and size of joint reinforcement.
    e. Each type and size of anchors, ties, and metal accessories.

C. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

E. Test Reports: Concrete masonry manufacturer's test reports for: units with integral water repellent admixture.

1. Mortar: Property (Proportion) requirements of ASTM C 270.
2. Grout complying with ASTM C 476. Include description of type and proportions of grout ingredients.
3. Masonry units: ASTM C67 and ASTM C140.
4. Field Mortar Base Line Compressive Test: ASTM C780.
5. Efflorescence tests for Brick: ASTM C67.
6. Durability tests for surface-coated brick: ASTM C67.

1.7 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

D. Grouting and Reinforcing: All masonry and grouting and reinforcing work shall be performed by masonry craft-workers who have successfully completed the International Masonry Institute (1-800-IMI-0988) training course for Grouting and Reinforced Masonry Construction, or equal.

E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

1. Provide manufacturer's certification for fire ratings.

F. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

1. Protect concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.

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 aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Deliver pre blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

F. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil

G. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.

1.9 WORKMANSHIP

A. Contractor shall be responsible for correction of work not conforming to specified requirements. Correct deficient work as directed by Owner's Representative.

B. Remove work found to be defective. Replace with new acceptable work.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Masonry General

1. Unit Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 "Specifications for Masonry Structures" except where exceeded by the requirements of the contract documents.
2. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined in accordance with ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means as acceptable to authorities having jurisdiction.
3. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color or uniform blend within ranges accepted for these characteristics from one manufacturer for each different product required for each continuous surface or visually related surfaces.
4. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

B. Concrete Block: Comply with referenced standards and as follows:

1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   a. Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated in drawings. If not shown in drawings, use length to produce coursing with little or no cutting.
2. Special Shapes: Provide non-standard blocks configured for corners, pre-fab bullnose for exposed corners (no grinding), and other detailed conditions.
3. Non-Loadbearing Units: ASTM C129.

a. Hollow block.
b. Normal weight.
c. Strength: Minimum 2,500 @ 28 days.

2.2 BRICK UNITS

A. Face Brick: ASTM C216, Type FBS, Grade SW.
1. Color and texture to match match existing.
2. Nominal size: match existing.

2.3 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
1. Hohmann & Barnard, Inc: www.h-b.com/sle.
2. Substitutions: See Section 01 2500 - Substitution Procedures.

B. All reinforcement and anchors for masonry, located in exterior walls, shall be hot dipped galvanized steel.

C. All reinforcement and anchors located in interior walls shall be galvanized steel.

D. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

E. Single Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss.
2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.
3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure. Flush weld all keys
4. Hohmann & Barnard - #120.

F. Adjustable Anchors For Connecting to Metal Stud.
1. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compession forces perpendicular to plane of wall.
2. Anchor Section: 14 gauge galvanized steel, anchor section for attaching to steel stud, through sheathing and insulation board.
3. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875-inch--diameter galvanized steel for exterior walls.
4. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
a. Homann & Barnard Stainless steel, "DW-10HS" x leg depth as required to suit applications.
b. Provide Homann & Barnard continues TeXtro-Seal Tape, 40 mil thick dual membrane multi-ply polyurethane/polymer modified asphalt.
c. Triangular Tie: Hohmann & Barnard, stainless steel Vee Tie (VBT), 3/16" diameter.

G. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

H. Partition Anchors: Partition anchors to provide lateral shear at upper limit of masonry wall with neoprene pad and anchor.
1. Hohmann & Barnard PTA-420 Series

2.4 EMBEDDED FLASHING MATERIALS

A. Membrane Non-Asphaltic Flashing Materials:
1. Use only where flashing is fully concealed in masonry.
2. Composite Polymer Flashings - Self-Adhering: Composite polyethylene; 40 mil thick with reinforced membrane Elvaloy KEE, solid-phase plasticizer and flexibilizer added to membrane

flashing. Provide pressure-sensitive adhesive and release paper, preformed shapes for outside, inside and end dams. as recommended by the manufacturer.

3. Verify sealants specified in Section 07 9200 - Joint Sealants are compatible with flashing.
4. Termination Bars: 1/8' x 1", stainless steel with foam seal. Use at top of all flashing.
5. Manufacturers:
    a. Substitutions: See Section 01 2500 - Substitution Procedures.

B. Flexible Flashing Membrane - For Steel Lintel Flashing
1. Self adhered Flashing Membrane with Drip Edge: Standard type, elastomeric and thermal plastic polymers combined with Dupont Elvaloy, reinforced with synthetic fibers and calendared into 40 mil thick sheets with rubberized adhesive, 1-1/2 inch sealant compatible drip edge and disposable silicone release sheet adhered to the bottom adhesive side.
2. Drip Edge: 3/8".
3. Provide primers, adhesives, pre-formed inside and outside corners and dams as recommended by the manufacturer.
4. Verify sealants specified in Section 07 9200 - Joint Sealants are compatible with flashing.
5. Termination Bars: 1/8" stainless steel with foam seal. Use at top of all flashing.
6. Manufacturers:
    a. Hyload Inc.; 5020 Enterprise Pkwy., Seville, OH 44273. ASD. Toll Free: 800-457-4056. Phone: 330-769-3546. Fax: 330-769-4153. Web: www.hyload.com. Email: info@hyload.com.
    b. Substitutions: See Section 01 2500 - Substitution Procedures.

C. Termination Bars: Stainless steel; compatible with membrane and adhesives.

D. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.

E. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.5 ACCESSORIES

A. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
1. Manufacturers:
    a. CavClear/Archovations, Inc; CavClear Polyisocyanurate Insulation System: www.cavclear.com.
2. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
    a. Manufacturers:
        a) Mortar Net Solutions; -: www.mortarnet.com.
    b. "Mortar net" with insect barrier.
        a) Thickness:1-1/2".
        b) Substitutions: See Section 01 2500 - Substitution Procedures.

B. Weeps:
1. Type: Molded PVC grilles, insect resistant.
2. Manufacturers:
    a. CavClear/Archovations, Inc: www.cavclear.com.

2.6 MASONRY CLEANERS

A. Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Products: :

a. Cleaners for Red and light-colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching:
   a) ProSoCo, Inc.Sure Klean No. 600 Detergent
b. Substitutions: See Section 01 2500 - Substitution Procedures

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

D. Notify Owner's representative if construction is not acceptable.

E. Do not proceed with construction until unacceptable conditions have been corrected.

3.2 PREPARATION

A. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.4 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running match existing.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

D. Brick Units:
   1. Bond: Match existing.

3.5 PLACING AND BONDING

A. General: Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in project.
   1. Masonry units shall be laid true, level, plumb and in uniform coursing in accordance with drawings. Corners and angles shall be square unless otherwise indicated in drawings.
   2. Lay only dry concrete masonry units. Do not wet concrete masonry units unless approved.
   3. Adjust masonry units into final position while mortar is soft and plastic. If units are displaced after mortar has stiffened, remove mortar, clean joints and units, and relay units with fresh mortar.
   4. Use full-sized units without cutting where possible. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction.

B. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

C. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets.

D. Layup walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

E. Bond Pattern for Exposed Masonry: Lay exposed masonry as follows unless indicated otherwise in drawings:
   1. Running Bond.
   2. Do not use units with less than nominal 4-inch horizontal face dimensions.
   3. Avoid use of less-than-half-sized units at corners, jambs, and where possible at other locations.
   4. Where indicated in drawings, match coursing, bonding, color, and texture of new masonry with existing masonry if not Running bond.

F. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to opening.

G. Nonbearing Interior Partitions: Build full height of story to underside of solid floor or roof structure above and as follows.
   1. Install compressible filler in joint between top of partition and underside of structure above. Brace top of wall as shown in drawings.

H. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

I. Lay hollow masonry units with face shell bedding on head and bed joints.

J. Remove excess mortar and mortar smears as work progresses.

K. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

L. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

M. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

N. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

O. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

P. Stopping and Resuming Work: In each course, rack back one-half unit length for one-half running bond or one-third unit length for one-third running bond. Do not tooth. Clean exposed surfaces of set masonry. Wet clay masonry units lightly if required. Remove loose masonry units and mortar prior to laying fresh masonry.

3.6 WEEPS/CAVITY VENTS

A. Install weeps in veneer walls at 24 inches on center horizontally directly as shown on drawings.

3.7 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

C. Install mortar diverter at every floor level. For wall cavities that exceed 11' in height, place an additional continuous trapezoidal strip on wall reinforcing anchors/ties at every 9' to 11' of wall height.

D. Flashing should extend at least 6" above the top of mortar diverter, as should any other materials used to fill space between mortar diverter and inside cavity surface.

E. No more than 1/4" should be left between mortar diverter and cavity’s inside surface (flashing or filler).

F. Installing Cavity-Wall Insulation:
   1. For attachment to metal framing backup anchor thru insulation and sheathing into the metal stud using masonry anchors specified. Butt joints tightly both ways. Install tongue and groove panels with tongue in the up position.
      a. Seal all joints between insulation board units in cavity with joint sealing tape, to form a tight seal at all joints, including areas around masonry anchors and other openings. Fill

voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

2. For attachment to masonry backup place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

3.8 HORIZONTAL JOINT REINFORCEMENT

A. General:
   1. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
   2. Lap joint reinforcement ends minimum 6 inches.
   3. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 16 inches horizontally and 16 inches vertically.

3.9 ANCHORED MASONRY VENEER TO LIGHT-GAUGE BACKUP WALLS

A. Anchor single-wythe masonry veneer to metal studs with masonry veneer anchors to comply with the following requirements:
   1. Install Self-Sealing Tape behind anchor sections.
   2. Space anchors as indicated but not more than 16 inches on-center vertically and horizontally. Install additional anchors within 1 foot of openings and at intervals around perimeter not exceeding 8 inches.

B. If masonry veneer is concrete-masonry, provide single-wythe joint reinforcing at 16 inches vertically, staggered with ties.

3.10 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

C. Install flashing a minimum of 6" above cavity mortar drainage system.

3.11 LINTELS

A. Provide masonry lintels where shown and wherever openings of more than 1 foot for brick-sized units and 2 feet for block-sized units are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installing. Temporarily support formed-in-place lintels.

B. Maintain minimum 8 inch bearing on each side of opening.

3.12 GROUTED COMPONENTS

A. General:
   1. Use grout to fill masonry. Do not use mortar.
   2. Reinforcement must be in place prior to grouting.
   3. Grout to 1½ inches below top of masonry units for each lift to form and interlock with subsequent masonry and grouting. Where bond beams occur, stop grout pour minimum 1½ inch below top of masonry. At top of masonry, fill grout space flush with tops of units and consolidate.

4. Consolidate grout using mechanical vibrator, and re-consolidate using mechanical vibrator after excess water is absorbed into masonry units.
    a. Do not consolidate or re-consolidate self-consolidating grout.

B. Low Lift Grouting:
1. Construct masonry wall up to 5 feet 4 inches (vertically) at a time. Minimum height of grout lift creating a cold joint shall equal splice length of reinforcing indicated in drawings.
2. Install vertical and horizontal reinforcing steel, anchors, and embedded items as masonry work progresses.
3. Grout walls in 5 foot 4 inch maximum lifts, consolidating and consolidating each lift. Stop grout 1½ inch below top of top course.
    a. Do not consolidate or re-consolidate self-consolidating grout.

3.13 BUILT-IN WORK

A. Install built-in items plumb, level, and true to line.

3.14 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.15 CUTTING AND FITTING

A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 BRICK REMOVAL AND REPLACEMENT

A. Carefully remove bricks on a piece by piece basis. Cut out full units from joint to joint and to permit replacement with full size units. Clean the edges of remaining bricks, to remove all mortar, dust, and loose debris in preparation for rebuilding.

B. Simultaneously remove only limited sections of existing masonry; support and protect masonry remaining next to and above the removal areas.

C. Install new cap flashings and wall flashing extensions, properly lapped under and connected to the existing wall flashings, as indicated on the drawings and specified elsewhere, before installing new bricks.

D. Wet bricks which have initial rates of absorption (suction) greater than 30 grams per 30 square inches per minute, (in accordance with ASTM C 67), to ensure the bricks are nearly saturated with water, but surface dry when laid.

E. Install new brick to replace removed brick. Fit replacement bricks to match the original bond and course pattern. Use a motor driven diamond blade wet saw to cut bricks with clean, sharp unchipped edges.

F. Lay replacement brick with completely filled bed, head and collar joints. Butter the ends with sufficient mortar to fill the head joints and shove the bricks into place.

G. Install new bricks with mortar joints to match the width of the adjoining brick joints. Tool the new joints to match existing joints in surrounding brickwork.

3.17 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

3.18 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

E. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

F. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.

G. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

H. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel un cleaned for comparison purposes. Obtain Owner’s representative 's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.19 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

3.20 MASONRY WASTE DISPOSAL

A. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL

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 SECTION INCLUDES

A. Structural steel support members and struts.

B. Base plates.

C. Anchor bolts, base and bearing plates.

D. Openings, reinforced and un-reinforced in structural steel.

1.3 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Contractor's design related professional design services.

B. Section 01 4533 - Code-Required Special Inspections and Procedures.

C. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

D. Section 09 9113 - Exterior Painting.

E. Division 23 - Mechanical for roof top units supported on steel frames.

1.4 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2017.

B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

C. ANSI/AISC 360, "Specification for Structural Steel Buildings

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

G. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).

H. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.

I. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

1. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.5 MATERIAL EVALUATION/QUALITY CONTROL

A. Contractor shall employ testing laboratory acceptable to Owner's Representative to perform material evaluation tests.

1. Refer to Section 01 4000 - Quality Requirements for requirements.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. General: Review of submittals will be for general conformance only. Compliance with requirements for materials, fabrication, erection, and dimensioning of structural steel shall be Contractor's responsibility. Resubmitted shop drawings shall have revisions identified and dated.

C. Material Data: Submit to Engineer laboratory test reports and other data as required to show compliance with specifications. Submit producer's or manufacturer's specifications and installation instructions for the following products:
   1. Structural steel, including certified copies of mill reports covering chemical and physical properties.
   2. High-strength bolts, including nuts and washers.
   3. Structural steel primer paint if used.
   4. Welding electrodes.
   5. Post-installed anchors (expansion, sleeve, or chemical adhesive) if used

D. Shop Drawings:
   1. Indicate profiles, sizes, locations of structural members, attachments, and fasteners.
      a. Submit Shop Drawings showing details of each individual steel shipping piece.
      b. Submit Erection Drawings showing location and attachment of individual steel shipping pieces. Including field installation details in Erection Drawings.
      c. Reference Contract Drawing number and addendum number in each shop and Erection drawing.
      d. Details including cuts, copes, connections, holes, bolts, and other pertinent information.
   2. Connections.
      a. Submit connection calculations in accordance with Option 3 of AISC Code of Standard Practice for Steel Buildings and Bridges. Calculations shall be stamped by a licensed Professional Engineer in New York State retained by Fabricator.
      b. Connections shown on shop drawings shall be coordinated with the submitted connection calculations. Submit written confirmation from Fabricator's Connection Design Engineer that the shop and erection drawings accurately incorporate the connection designs.
   3. Bolt Certification: Submit to testing agency certifications that bolts, nuts, and washers furnished comply with specifications. Submit manufacturer's inspection certificates for mill tests. For fasteners to be accepted, lot numbers on kegs, boxes, or bags must correlate with lot numbers shown in accepted test certificates and identification numbers in mill test reports. Manufacturer's symbol and grade markings must appear on bolts and nuts.
   4. Indicate loads.
   5. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
   6. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   7. Indicate type, size, and length of bolts. Identify pretensioned and slip-critical high-strength bolted connections.
   8. For structural-steel connections indicated to comply with design loads, include structural analysis data prepared by the qualified professional engineer responsible for their preparation.
   9. Qualification Data: For Installer, fabricator and professional engineer.

E. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

F. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

G. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

H. Designer's Qualification Statement.

I. Fabricator's Qualification Statement.

J. Field Modifications: Submit drawings showing field modifications required to conform to actual field conditions or as required to correct errors in shop drawings, fabrication, or erection. Refer to Section 01 7800 - Closeout Submittals.

1.7 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Fabricator: Company specializing in performing the work of this section with minimum five (5) years of documented experience, and is a designated an AISC Certified Fabricator, Category STD.

C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

D. Erector: Company specializing in performing the work of this section with minimum five (5) years of documented experience and is a designated an AISC-Certified Erector. Category CSE.

E. AISC Certification for Fabricators and Erectors may be waived at the discretion of Owner's Representative provided acceptable written quality assurance and quality control plan is submitted and approved.

F. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in New York State.

G. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in New York State and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

1. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

H. At completion of fabrication, Fabricator shall submit Certificate of Compliance to Owner's Representative or testing agency stating work was performed in accordance with approved Construction Documents in accordance with Chapter 17 of the International Building Code (IBC) as referenced by the New York State Uniform Code.

1.8 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.9 PRODUCT HANDLING

A. Store material in horizontal position on supports above ground.

B. Protect from weather, and keep free of dirt and debris.

C. Handle material carefully so it is not bent or marred.

D. Store bolted fastener components in closed containers protected from moisture and contamination. Remove from protective storage containers only number of fasteners required for one shift. Return fasteners not installed at end of work day to protective storage.

E. Repair or replace damaged materials. Do not incorporate in work fastener components that accumulate rust or dirt.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel W Shapes and Tees: ASTM A992/A992M.

B. Rolled Steel Structural Shapes: ASTM A992/A992M.

C. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

D. Pipe: ASTM A53/A53M, Grade B, Finish black.

E. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.

F. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

I. Touch-Up Primer for Galvanized Surfaces: Refer to Secion 09 9113, complying with VOC limitations of Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

2.2 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors where indicated.

D. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work
   1. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
      a. Grind butt welds flush.
      b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.
   2. All exposed welds shall be Type 1

2.3 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP 6/NACE No. 3, "Commercial Blast Cleaning" for all exposed steel.

B. SSPC-SP 3, "Power Tool Cleaning" for steel not exposed

C. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

2.4 SOURCE QUALITY CONTROL

A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least 10 percent of bolts at each connection.

B. Welded Connections: Visually inspect all shop-welded connections and test at least 50 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

B. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Owner's Representative.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates
   1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
      a. Leveling plates will not be permitted.
   2. Weld plate washers to top of base plate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and base and bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts

3.4 TOLERANCES

A. Tolerances shall be within limits in AISC "Code of Standard Practice."

B. Fabrication and mill tolerance shall be within limits in AISC "Standard Mill Practice."

3.5 TOUCH-UP PAINTING

A. After erection is complete, touch up paint-damaged shop coats and welded areas with shop primer paint applied in accordance with manufacturer's instructions.

B. Touch up paint damaged galvanized surfaces and welded areas with galvanizing touch-up compound or cold-galvanizing compound applied in accordance with manufacturer's instructions.

3.6 TEMPORARY SHORING AND BRACING

A. Provide temporary shoring and bracing members as required with connections of sufficient strength to bear imposed loads.

B. Remove temporary members and connections when permanent members are in place and final connections are made.

C. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

3.7 FIELD QUALITY CONTROL

A. Contractor will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections

B. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

C. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least 20 percent of bolts at each connection.

D. Welded Connections: Visually inspect all field-welded connections and test at least 25 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION

SECTION 05 4000
COLD-FORMED METAL FRAMING

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 SECTION INCLUDES

A. Formed steel stud exterior wall framing for duct enclosures.

1.3 RELATED REQUIREMENTS

A. Section 01 4533 - Special Inspections and Strucutral Testing.

B. Section 04 2000 - Unit Masonry for masonry anchors, cavity insulation., and embeded flashings.

C. Section 05 1200 - Structural Steel .

D. Section 05 3100 - Steel Decking.

E. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.

F. Section 07 2100 - Thermal Insulation: Insulation within framing members.

G. Section 07 2500 - Weather Barriers: Weather barrier over sheathing.

H. Section 07 5323 - EPDM ROOFING

I. Section 07 6200 - Sheet Metal Flashing and Trim: Head and sill flashings.

J. Section 07 9200 - Joint Sealers .

K. Section 09 2116 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

1.4 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

B. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.

F. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members; 2018.

G. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2011a (Reapproved 2015).

H. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

I. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

K. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

L. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.6 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated

B. Design Loads:
   1. Roof Dead Load: 20 psf.
   2. Live Loads: 300 lbs concentrated
   3. Snow Loads: 35 psf.
   4. Ultimate wind speed: 125 mph
      a. wind load
   5. Wind Loads: [40] psf positive and [40] psf negative.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations and manufacturer's brochures showing section properties and specifications. .

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, type and location of fasteners, and special framing, and accessories or items required of related work.
   1. Provide elevations showing stud layout.
   2. Indicate locations of wind bracing straps and connections. For locations see structural drawings.
   3. Describe method for securing studs to tracks and for bolted framing connections.
   4. Show framing above, below and each side of openings with all required fasteners.
   5. Provide calculations for loadings and stresses of framing, stamped by a Professional Structural Engineer. Provide calculations showing that framing around openings can withstand minimum wind load of 40 psf on windows and door.
   6. Masonry anchors as shown on structural and architectural drawings.

E. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction

F. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .

1.8 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.9 MOCK-UP

A. Provide mock-up of exterior framed wall, including components specified elsewhere, such as insulation, sheathing, window frame, door frame, exterior wall finish, and interior wall finish.

B. Location: As directed.

C. Mock-up may remain as part of the Work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Criteria: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: Refer to 1.6 (B).
   4. Live load deflection meeting the following, unless otherwise indicated:
      a. Roofs: Maximum vertical deflection under live load: 1/240 of span.
      b. Exterior Walls: Maximum horizontal deflection under wind load: 1/360 of span. 1/600 of span at walls with brick veneer.
   5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
   7. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, panel failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
   8. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials

C. Shop fabricate framing system to the greatest extent possible.

D. Deliver to site in largest practical sections.

2.3 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
   1. Gage and Depth: As indicated on the drawings and as required to meet specified performanceminimum levels..
   2. Galvanized in accordance with ASTM A653/A653M, G90/Z275 coating.
   3. Provide components fabricated from ASTM A1008/A1008M, Designation SS (structural steel).

B. Framing Connectors: Factory-made, formed steel sheet.

1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch, and factory punched holes and slots.
2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.
5. Wall Stud Bridging Connections: Provide mechanical load-transferring devices that accommodate wind load torsion and weak axis buckling induced by axial compression loads. Provide bridging connections where indicated on the drawings.

2.4 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
   1. Products:
      a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series: www.ITWBuildex.com.

B. Anchorage Devices: Powder actuated.

C. Welding: In conformance with AWS D1.1/D1.1M.

2.5 WALL SHEATHING

A. Section 09 2662 - Gypsum Sheathing.

2.6 ACCESSORIES

A. Interior Vapor Barrier: Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch thick, clear.
   1. Applied between studs and gypsum board.
   2. Tape: Bright aluminum seld-adhering type, mesh reinforced, 2" wide.

B. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.7 SILL-SEALER GASKETS

A. Ribbed polyethylene foam, 3/16 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
   1. Product: Reflectix Inc. #1 School Street, P.O. Box 108, Markleville, IN 46056

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building framing components are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.2 PREPARATION

A. Grout bearing surfaces uniform and level to ensure full contact of track webs on supporting concrete or masonry construction

3.3 INSTALLATION OF STUDS

A. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations

B. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

C. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 16 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

D. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using welding or fastener method. Studs must bear tight on tracks at top and bottom of wall.

1. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
2. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads

E. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

F. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members

G. Install temporary bracing and supports to secure framing and support loads

H. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

I. Install intermediate studs above and below openings to align with wall stud spacing.

J. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

K. Attach cross studs to studs for attachment of fixtures anchored to walls.

L. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

M. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Drawings. Fasten jamb members together to uniformly distribute loads.

N. Provide cross bracing or horizontal bracing at story heights of greater than 14'-0".

O. Install runner tracks and jack studs above and below wall openings in addition to full height double studs. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs

P. Touch-up field welds and damaged galvanized surfaces with primer.

3.4 INSTALLATION OF WALL SHEATHING

A. Refer to Section 09 2662 - Gypsum Sheathing.

3.5 INSTALLATION OF WEATHER BARRIER

A. Refer to Section 07 2500 - Weather Barriers.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing. Installation of studs, wind bracing straps and framing at wall openings to be checked against approved shop drawings including connections.

B. Screws and PDF's will be checked for conformance with approved shop drawings. All deficiencies will be noted in field reports and re-inspected until approved.

C. Field and shop welds will be subject to inspection and testing.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Remove and replace Work that does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.

C. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion

3.8 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Variation of any Member from Plane: 1/16 inch.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

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 SECTION INCLUDES

A. Shop fabricated steel items.

B. Steel framing for dunnage for mechanical/electrical equipment, roof screen and miscellaneous equipment.

C. Roof framing for openings in roof.

D. Steel supports for suspended ceiling assemblies.

E. Rooftop duct support frame

F. Steel framing and supports for applications where framing and supports are not specified in other Sections.

G. Loose lintel where indicated.

H. Ship's ladder.

I. Aluminum gratings (for attic platform).

1.3 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements for Contractor's design related professional design services.

B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 1200 - Structural Steel: Structural steel column anchor bolts.

D. Section 05 5213 - Pipe and Tube Railings.

E. Section 09 9113 - Exterior Painting: Paint finish.

F. Section 09 9123 - Interior Painting: Paint finish.

1.4 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; current edition.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

G. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

L. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.

M. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For the following:

1. Lintels
2. Ship's ladder.
3. Gratings
4. Paint products.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer, licensed in the State of NY responsible for their preparation.
4. Connections:
   a. Submit connection calculations in accordance with Option 3 of AISC Code of Standard Practice for Steel Buildings and Bridges. Calculations shall be stamped by a licensed Professional Engineer in New York State retained by Fabricator.
   b. Connections shown on shop drawings shall be coordinated with the submitted connection calculations. Submit written confirmation from Fabricator’s Connection Design Engineer that the shop and erection drawings accurately incorporate the connection designs.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of NY and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

1.8 PROJECT 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 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 to established dimensions.
2. Provide for trimming and fitting at site.

1.9 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. 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.

B. Coordinate with Plumbing, Mechanical, and Electrical Contractor's equipment prefabricated equipment, curbs, portals, and conduit.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, galvanized to ASTM A 153/A 153M where connecting galvanized components.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

H. Touch-'Up Primer for Galvanized Surfaces: Refer to Section 09 9113 Exterior Painting.

2.2 FABRICATION

A. Shop Assembly: Preassemble 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, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work

D. Fit and shop assemble items in largest practical sections, for delivery to site.

E. Fabricate items with joints tightly fitted and secured.

F. 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. Do not use ferrous material and equipment on stainless steel components.
3. Obtain fusion without undercut or overlap.
4. Remove welding flux immediately.
5. 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

G. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

H. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, 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, conducted by a qualified independent testing agency.

1. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594

2.4 FABRICATED ITEMS

A. Lintels: As detailed; Fabricate and prime paint. Refer to Section 09 9123 for finish coat..

1. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated
2. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.
3. Galvanize loose steel lintels located in exterior walls.
4. Refer to Lintel Schedule on drawings.

B. Size of Channels: 1-5/8y 1-5/8 inches.

2.5 SLOTTED CHANNEL FRAMING

A. Cold-formed metal channels with continuous slot complying with MFMA-3

1. Size of channels: 1 5/8y 1-5/8 inches
2. Material: Steel complying with ASTMA A 1008/A 1008M, commercial steel, Type B, 0.0677-inch minimum thickness; coated with rust-inhibitive, baked-on acrylic enamel. Color as selected by Architect.
3. Provide where shown on drawings.
4. Basis of Design: UniStrut P-1000 Channel
5. Rods 1/2 inch diameter
    a. Connector fittings: Provide at all tube connections and intersections. Fittings as recommended by manufacturer to provide complete assembly.

2.6 PLATFORM BAR GRATING:

A. Configuration: As inidcated on drawings and details.

1. Manufacturer: McNicholos
    a. Item Number: 6715316324
    b. Series: TB-940-150-SAFE-T-GRID (19-S-4) - ADA

B. Description:

1. Aluminum alloy 6063-T6, mill finish.
2. Bar size - 1 1/2" height x 0.940" Top flange width T-Bar.
3. Bar Spacing - 1 3/16" on center.
4. Clear Space between bar top flanges - 0.2475"
5. Grooved surface.

2.7 ROOFTOP DUCT SUPPORT SYSTEMS

A. Configuration: As indicatd on drawings.

B. Adjustable H-Stand support consisting of hot dipped galvanized strut channel framing and direct mount bases.

C. Product: Rooftop support systems, model RTSHXXXX-P-D-18" -48" W

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

2.9 FINISHES - STEEL

A. Refer to Section 09 9123 Interior Painting and Section 09 9113 Exterior Painting.

B. Prime paint steel items.

1. Prime paint all steel items except:
   a. Galvanize items to be embedded in concrete and items to be embedded in masonry.
   b. Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

C. Prepare surfaces to be primed in accordance with SSPC-SP2.

D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

E. Prime Painting: One coat.

1. Refer to Section Section 09 9123 Interior Painting and Section 09 9113 Exterior Painting for preparation, prime coats and finish coats for all exterior exposed ferrous metal.

F. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

G. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.10 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.3 INSTALLATION

A. Install fabricated items as per manufacturer's instructions

B. Install items plumb and level, accurately fitted, free from distortion or defects.

C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components as indicated on shop drawings.

E. Perform field welding in accordance with AWS D1.1/D1.1M.

F. Obtain approval prior to site cutting or making adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

END OF SECTION

SECTION 05 5100
METAL STAIRS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Stairs with concrete treads.

B. Stairs with grating treads.

C. Prefabricated stair treads and nosings.

D. Steel preparation for painting.

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

B. Section 05 5213 - Pipe and Tube Railings: Metal handrails for the stairs specified in this section.

C. Section 09 9113 - Exterior Painting: Paint finish.

D. Section 09 9123 - Interior Painting: Paint finish.

1.4 REFERENCE STANDARDS

A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.

B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2017.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

I. ASTM A 570/A 570M, Grade 30, Uncoated, Hot-Rolled Steel Sheet: Commercial quality, complying with ASTM A 569/A 569M; or structural quality, unless another grade is required by design loads.

J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

K. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015.

L. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.

M. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

N. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

O. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

P. ASTM E 894: - Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.

Q. ASTM E935: - Standard Test Method for Performance of Permanent Metal Railing Systems and Rails for Buildings.

R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

S. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.

T. New York State Building Code.

U. NAAMM AMP 510 - Metal Stairs Manual; 1992.

V. NAAMM MBG 531 - Metal Bar Grating Manual; 2017.

W. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual; 2009.

X. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

Y. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

Z. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide metal-pan stair treads., Paint products., and Grout. and open metal bar grates.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1. Include plans, elevations, sections, and details of metal stairs and their connections. Include angle post supports and angle hangars for intermediate landings welded to floor bearing.
2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
3. Include NYS licensed engineer's stamp or seal on each sheet of shop drawings.
4. Show all retainer channels and connections for wire mesh infill panels.

D. Welders' Certificates.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

F. Qualification Data: For professional engineer.

G. Structural calculations sealed and signed by professional engineer.

1.6 PERFORMANCE REQUIREMENTS

A. Structural Performance of Stairs: Provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
4. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding the allowable design working stress of materials for handrails, railings, anchors, and connections:
   1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
      a. Concentrated load of 200 lbf applied at any point and in any direction.
      b. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.
   2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
      a. Concentrated load of 200 lbf applied at any point and in any direction.
      b. Uniform load of 50 lbf/ft. applied in any direction.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.
   3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.
      a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guards.

1.7 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in New York, or personnel under direct supervision of such an engineer.
   1. Engineering services are defined as those performed for installations of metal stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent.
   2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

C. Fabricator Qualifications: A qualified steel fabricator with a minimum of five (5) years experienced in producing metal stairs similar to those indicated for this Project that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172).
   1. AWS D1.1, "Structural Welding Code--Steel AWS D1.3, "Structural Welding Code--Sheet Steel
   2. Installer Qualifications: Arrange for metal stairs specified in this Section to be fabricated and installed by the same firm.
   3. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections

D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience and is a designated an AISC-Certified Erector.

1.8 COORDINATION

A. Coordinate installation of anchorages for metal stairs. 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

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Prefabricated Metal Stairs:
   1. Lapeyre Stair, Inc: www.lapeyrestair.com/#sle.
   2. Pacific Stair Corporation: www.pacificstair.com.

3. Substitutions: See Section 01 6000 - Product Requirements.

2.2 FERROUS METALS

A. Metal Surfaces, General: Provide metal free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Uncoated, Hot-Rolled Steel Sheet: Commercial quality, complying with ASTM A 569/A 569M; or structural quality, complying with ASTM A 570/A 570M, Grade 30, unless another grade is required by design loads.

F. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

G. Steel Bars for Grating Treads: ASTM A 36/A 36M.

2.3 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.

1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
3. Structural Design: Provide complete calculations for stair and railing assemblies complying with the applicable local code and loads specified in 1.6 A & B.
4. Dimensions: As indicated on drawings.
5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
7. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:

1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
   a. Welded Joints: Continuously welded and ground smooth and flush.
   b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
   c. Exposed Edges and Corners: Eased to small uniform radius.
   d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
2. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
   a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
   b. Welds Exposed to View: Ground smooth and flush.
   c. Mechanical Joints: Butted tight, flush, and hairline.
   d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
   e. Exposed Edges and Corners: Eased to small uniform radius.
   f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
   1. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
   2. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
   3. Machine Screws: ASME B18.6.3.
   4. Lag Bolts: ASME B18.2.1.
   5. Plain Washers: Round, carbon steel, ASME B18.22.1.
   6. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.
   7. 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 and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
      a. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

E. Galvanizing: Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.
   1. Fill vent holes and grind smooth after galvanizing.

2.4 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 1-1/2 inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
   4. Concrete Reinforcement: Welded wire mesh.
   5. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
   1. Nosing Depth: Match existing.
   2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Rolled steel channels.
   1. Stringer Depth: Match existing.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Finish: Shop- or factory-prime painted.

2.5 METAL STAIRS AND PLATFORM WITH GRATING TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Open.

C. Treads: Steel bar grating.
   1. Grating Type: Welded.
   2. Bearing Bar Depth: 7/16 inch, minimum.
   3. Top Surface: Non Slip.
   4. Nosing: Manufacturer's standard.

5. Factory Fabricated Tread and Nosing: Manufacturer's standard, with integral tread, nosing, abrasive filler and factory applied finishes.
6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.
7. Manufacturer: GCM Series by McNichols 1-800-237-3820

D. Stringers: Rolled steel channels.
1. Stringer Depth: 12 inches.
2. End Closure: Sheet steel of same thickness as risers welded across ends.

E. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.
1. Provide templates at open-sided edges of grating platforms. Weld grating to platform framing

F. Railings: Steel tube railings.. Refer to drawings.

G. Finish: Galvanized after fabrication.

2.6 HANDRAILS AND GUARDS

A. Guards: Refer to Section 05 5213 - Pipe and Tube Railings.

2.7 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

C. Gratings: Bar gratings complying with NAAMM MBG 531 or NAAMM MBG 532, whichever applies based on bar sizes.

D. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.

E. Concrete Reinforcement: Mesh type, galvanized. See paragraph 2.9.B.

2.8 ACCESSORIES

A. Concrete Fill and Reinforcing Material: Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 4,000 psi, unless higher strengths are indicated.

B. Welded Wire Fabric: ASTM A 185, 2 by 2 inches--W1.4 by W1.4, unless otherwise indicated.

C. Grout: Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

D. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

H. Grout: Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.9 FABRICATION, GENERAL

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated or required by code.
   1. Commercial class, unless otherwise indicated.

B. Shop Assembly: Preassemble stairs in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Provide miscellaneous metal framing, clips, brackets, bearing plates, and other components necessary to support and anchor stairs treads and platforms on supporting structure.
   1. Join components by welding.

D. 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.

E. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Ease exposed edges to a minimum radius of approximately 1/32 inch. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

G. Weld connections 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. Weld exposed corners and seams continuously, unless otherwise indicated.
   5. 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.

H. Join components by welding

I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.10 SHOP FINISHING

A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Do not prime surfaces in direct contact with concrete or where field welding is required.

E. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
   2. Number of Coats: One.

F. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

G. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
   1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

2. Provide for all exterior components.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete with setting templates.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for self supporting stair.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

F. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

G. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction

H. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

I. Obtain approval prior to site cutting or creating adjustments not scheduled.

J. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 INSTALLING STEEL RAILINGS AND HANDRAILS

A. Refer to Section 05 5213 - Pipe and Tube Railings.

3.5 FIELD QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
   1. Provide testing agency with access to places where work is being fabricated or produced to perform tests and inspections

B. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

C. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts", testing at least 25 percent of bolts at any given connection. If any bolt fails, test all bolts at that connection. Provide follow up reports.

D. Welded Connections: Visually inspect all field-welded connections and test at least 25 percent of welds using the following:
   1. Ultrasonic testing performed in accordance with ASTM E164.
   2. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   3. Magnetic particle inspection performed in accordance with ASTM E709.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
    a. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1

3.6 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.7 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."

END OF SECTION

SECTION 05 5213
PIPE AND TUBE RAILINGS

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 SECTION INCLUDES

A. Wall mounted handrails.

B. Railing, hand railings, and guardrails.

C. Free-standing railings at steps.

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

1.4 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.

E. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2016.

F. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2010e1.

G. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications; 2013, with Editorial Revision (2014).

H. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Samples: Submit two, 12 inch long samples of handrail. Submit two samples of finish welding.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

E. Designer's Qualification Statement.

F. Fabricator's Qualification Statement.

1.6 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of New York, or personnel under direct supervision of such an engineer.
   1. Engineering services are defined as those performed for installations of handrails and railing systems that are similar to those indicated for this Project in material, design, and extent.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.
   1. AWS D1.2 Structural Welding Code – Aluminum.
   2. AWS D1.6, "Structural Welding Code--Stainless Steel."

C. Fabricator Qualifications:
   1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience in producing handrails and railing similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
   2. All railings and handrails specified in this Section to be fabricated and installed by the same firm.

PART 2 PRODUCTS

2.1 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, handrails, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

C. Concentrated Loads: Design railing assembly, handrails, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

F. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

G. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
   1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

H. Dimensions: See drawings for configurations and heights.
   1. Top Rails: 1-1/2 x 1-1/2 inch square.
   2. Posts: 1-1/2 inches square.

I. Guards:
   1. Top Rails and Posts: Tube rails unless otherwise indicated.
      a. 1-1/2" x 1-1/2"

J. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

1. For anchorage to concrete, form or core drill holes not less than 5" (127 mm) deep and 3/4' (19 mm) greater than outside diameter of post. Clean holes of loose material. Insert posts and fill annular space between post and concrete with non-metallic grout, mixed and placed to comply with anchoring material according to manufacturer's direction.
2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
3. For anchorage to stud walls, provide backing plates, for bolting anchors.

2.2 ALUMINUM MATERIALS

A. Aluminum Pipe: Schedule 40; ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M.

B. Welding Fittings: No exposed fasteners; machined aluminum.

C. Straight Splice Connectors: Concealed spigot; machined aluminum.

D. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

2.3 STEEL RAILING MATERIAL

A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

E. Straight Splice Connectors: Steel welding collars.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

G. Finish: All components shall be hot dipped galvanized.

2.4 BRACKETS, CONECTORS AND MISCELLANEOUS ITEMS

A. Wall Brackets: Provide wall brackets as follows:
1. Universal Weld Bracket as manufactured by Wagner Company.
a. Steel painted.

B. Wedge-Lock Welding Connector: Wagner steel connector to align railings. Weld all joints.

C. Wall Returns: Wagner steel wall return with two (2) holes.

D. Base Flanges: Wagner heavy duty flush base flange.

2.5 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Division 9 painting Sections.
1. Use primer 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).

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

D. Anchoring Cement: Factory-packaged, non-shrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.6 FABRICATION

A. Provide complete assemblies including handrails, railings, clips, brackets other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding, unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces

B. Shop Assembly: Pre-assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

C. Accurately form components to suit specific project conditions and for proper connection to building structure.

D. Fit and shop assemble components in largest practical sizes for delivery to site.

E. Fabricate components with joints tightly fitted and secured.

F. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work

G. Welded Joints:
1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
2. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

H. Weld connections that cannot be shop welded due to size limitations.
1. Weld in accordance with AWS D1.1/D1.1M.
2. Match welding.
3. Clean welds and abraded areas
4. Touch up shop primer and factory-applied finishes.
5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

I. Close exposed ends of railing members with prefabricated end fittings.

J. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

L. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

2.7 STEEL AND IRON FINISHES

A. For ungalvanized steel railings, provide ungalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
1. Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

C. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

D. For finish painting refer to Section 09 9113 - Exterior Painting.

2.8 ALUMINUM FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
1. Use for all exterior components.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip aluminum where site welding is required.

B. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 1010
ROOF RELATED ROUGH CARPENTRY

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 SECTION INCLUDES

A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and including, but not limited to, the following:
   1. Related wood nailers, blocking, shims, and plywood.

1.3 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation

B. Section 07 5323 - EPDM Roofing

C. Section 09 2116 - Gypsum Board Assemblies

D. Section 07 7200 - Roof Accessories.

1.4 REFERENCE STANDARDS

A. APA PRP-108 - Performance Standards and Qualification Policy for Structural-Use Panels (Form E445); 2001.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.

E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2018a.

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

H. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

I. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. ICC (IECC) - International Energy Conservation Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. PS 1 - Structural Plywood; 2009.

L. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2015.

M. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. A firm (Installer) with at least 5 continuous years experience performing carpentry work comparable to that required for this project, employing personnel skilled in the work specified.
   2. The Installer shall directly employ the personnel performing the work of this section.
   3. The Installer shall have a full time supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience in work similar in nature and scope to this project, and speak fluent English.

B. Pre-Construction Conference: Attend the pre-construction meeting to discuss how and when carpentry work will be performed and coordinated with other work, and how the building will be kept watertight as work occurs.

1.6 SUBMITTALS

A. Submit the following items far enough in advance to obtain approval prior to performing any work on site:
   1. A pre-work site and building inspection report with photos, to document conditions before work starts.
   2. Mill or Manufacturer data sheets to identify the source for each type of lumber and fastener.
   3. Shop drawings or 2 foot long on-site samples which show the size, shape, configuration and method of fastening for all wood blocking assemblies, and which show how the blocking assemblies will relate to other adjoining work.
   4. Simultaneously provide all technical data submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
      a. Submittals shall be prepared and made by the firm that will perform the actual work.
      b. Provide electronic submittals in pdf format, organized in folders by Section.

B. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders for each building to the Owner's Representative.

C. Manufacturer's Certificate: Certify that wood products supplied meet or exceed specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials dry at all times.
   1. Cover with tarps and protect against exposure to weather and contact with damp or wet surfaces.

B. Support stacked products to prevent deformation and to allow air circulation.

C. Do not overload the structure when storing material on the roof. Material stored on the roof shall be placed on 2 by 10 wooden planks, placed over 1-1/2 inch foam insulation, that is laid on a layer of 6 mil fire retardant polyethylene.

1.8 WARRANTY/GUARANTEE

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a two (2) year period after Date of Substantial Completion.

C. Provide a written Contractor's Guarantee which guaranties that all work will remain free of material and workmanship defects and in a watertight condition for a five (5) year period beginning upon Final Completion:
   1. Defective work includes but is not limited to the following types of failure: leakage, delamination, lifting, loosening, splitting, cracking, and undue expansion.
   2. The Contractor's Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
   3. The Guarantee shall include the removal and replacement of items or materials installed as part of the original work, if removal is needed to affect guaranteed repairs.

D. Provide one Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple sections.

E. The Guarantee shall take effect no more than 30 days before the satisfactory completion of all punch list work.

F. The Contractor’s Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor’s Guarantee.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wood, including shims, nailers, blocking, furring and similar members, in the sizes indicated, worked into the shapes shown, and as follows:
   1. Lumber: Douglas Fir dimension lumber, free of large knots and other imperfections.
   2. Plywood: Exterior grade APA rated Type CDX underlayment plywood.
   3. Beveled Siding: Utility grade cedar, redwood, or synthetic siding, 1/2 inch by 6 inches and 3/4 inch by 10 inches wide, tapered to 1/8 inch thick.

B. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.
   2. Pre-Work Conference: Attend the pre-roofing meeting to discuss how carpentry work will be performed and coordinated with other work.

C. Lumber fabricated from old growth timber is not permitted.

D. Metal including light gage metal channels and studs shall be factory formed of minimum 20 gauge cold, unless otherwise noted, formed galvanized steel.

E. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
   1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
   2. Treat lumber in contact with roofing, flashing, or masonry.

2.2 FASTENERS

A. Hot dipped galvanized steel, stainless steel, or steel covered with a proprietary rust inhibiting coating.

B. Use screws wherever possible, minimum size diameter #12. If nails are used they shall be annular ring shank type. Do not use dry wall screws to secure wood blocking assemblies.

C. Metal and Finish: Stainless steel for high humidity and preservative-treated wood locations, galvanized elsewhere.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Coordinate carpentry work with the installation of the roofing system, insulation, flashings, and other similar items.

B. Shim and set carpentry work plumb and true, except provide slope at the top surfaces of horizontal members as indicated.

C. Stagger joints in built up assemblies at least 2 feet to obtain maximum strength. Provide the appropriate shapes needed and adjust wood members to suit existing conditions for full bearing and secure attachment. Discard defective material, and pieces which are too small, and fabricate the work with a minimum of joints and an optimum joint arrangement.

D. Securely attach carpentry work to resist a pull of 275 pounds per lineal foot in any direction. Countersink all fasteners flush unless otherwise shown.

E. Blocking used for the attachment of roof assembly and flashing shall be dry prior to roof or flashing is installed.

F. Space fasteners to achieve adequate holding power, generally as follows:
   1. Anchor bolts embedded in concrete, drilled anchors into concrete or masonry, screws into a steel deck or structural steel member, or screws into wood framing: 12 inches on center.
   2. Nails into wood: 8 inches on center.
   3. Install two rows of fasteners on blocking wider than 5 inches.

G. Fit carpentry work neatly scribed and cut to fit within 1/8 inch of adjoining materials. Position furring, nailers, blocking, shims and similar supports for the proper attachment of subsequent work.

H. Fasten wood blocking assemblies to metal decks with #12 screws. Pre-drill holes as needed. .

3.2 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Contractor shall inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any leaks or damage, prior to performing any work.

B. The Owner's Representative will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. Frequently clean up all refuse, rubbish, scrap materials and debris so the work site presents a neat, orderly and workmanlike appearance.

F. Carefully clean the roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.3 WASTE DISPOSAL

A. Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.

B. Comply with applicable regulations.

C. Do not burn scrap on project site.

D. Do not burn scraps that have been pressure treated.

E. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

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 SECTION INCLUDES

A. Board insulation where indicated on drawings.

B. Concealed building insulation.

C. Batt insulation for interior partitions.

D. Batt insulation in exterior wall construction.

1.3 RELATED REQUIREMENTS

A. Section 07 5323 - EPDM Roofing.

1.4 REFERENCE STANDARDS

A. ASTM C 203- Breaking Load and Flexural Properties of Block-Type Thermal Insulation ASTM C 203

B. ASTM C272 Water Absorption

C. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

E. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

G. ASTM D 696 Coefficient of Linear Thermal Expansion.

H. ASTM D1621 Compressive Strength.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

J. ASTM E 119 Fire-Resistance Ratings

K. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

L. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016a.

M. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on installation techniques.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five (5) years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

D. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency
   1. Surface-Burning Characteristics: ASTM E 84.
   2. Fire-Resistance Ratings: ASTM E 119.
   3. Combustion Characteristics: ASTM E 136.

E. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm air velocity.

F. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.7 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.8 WARRANTY

A. Provide manufacturer's written that the actual thermal resistance of the extruded polystyrene insulation will not vary by more than ten (10%) from its published thermal resistance.
   1. Warranty Period: 15 years.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation Over Metal Stud Framed Walls, Continuous: Extruded polystyrene (XPS) carbon black board.

C. Insulation on Inside of Framed Walls with Exposed Facer Providing Interior Finish: Glass-fiber-reinforced polyisocyanurate with exposed facers.

D. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.

E. Insulation in Rated Metal Framed Walls.

2.2 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   4. Board Size: As required.
   5. Board Edges: Square.
   6. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
   7. Thermal Resistance: per inch, ASTM C518 @ 75°F R-value 5.0
   8. Compressive Resistance: 400 psi.
   9. Products:
      a. Formuler 400 as manufactured by Owens-Corning..
      b. Locations: Under poured in place concrete slab in stair.

10. Substitutions: See Section 01 2500 Substitution Procedures.

2.3 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Formaldehyde Content: Zero.
   5. Thermal Resistance: R-19 walls.
   6. Thickness: as required to fill stud depth.
   7. Facing: Unfaced.
   8. Creased: Provide material 1" wider that standard stud spacing to bow into stud cavity.
   9. Manufacturers:
      a. Owens Corning Corp: "FiberGlas" thermal batt insulation www.owenscorning.com.
         a) Locations: All exterior partitions
   10. Substitutions: Section 01 2500 Substitution Procedures.

B. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   2. Thermal Resistance: R-value of 38.
   3. Thickness: as required to fill stud cavity..
   4. Manufacturers:
      a. "Thermafiber SAFB" Thermafiber, Inc: www.thermafiber.com
         a) Locations: All interior partitions.
   5. Substitutions: See Section 01 2500 Substitution Procedures..

2.4 ACCESSORIES

A. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.

B. Adhesive: Type recommended by insulation manufacturer for application.

C. Weeps:
   1. Type: Molded PVC grilles, insect resistant.
   2. Manufacturer:
      a. Hohmann & Barnard, Inc: www.h-b.com.

D. Cavity Vents:
   1. Type: Molded PVC grilles, insect resistant.
   2. Manufacturer:
      a. Hohmann & Barnard, Inc: www.h-b.com <http://www.h-b.com>.
         a) Location in brick cavity

E. Cavity Wall Insulation:
   1. Extruded-Polystyrene Board Insulation: Rigid, cellular, polystyrene thermal insulation with closed cells and integral high-density skin; formed by the expansion of polystyrene base resin with a carbon-black filler in an extrusion process to comply with the following characteristics:
      a. Aged thermal resistance (R-value) for 1-inch thickness of 5.0, deg F x h x sq. ft./Btu at 75 deg F at 5 years.
      b. Compressive strength: 25 as per ASTM D-1621.
      c. Flexural Strength: 75 as per ASTM C-203.
      d. Water Absorption: 0.10 as per ASTM C-272.
      e. Water Vapor Permeance: 0.6 as per ASTM E-96.

f. Water affinity: Hydrophobic.

g. Water Capillarity: None. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM C 1314, and as follows:

a) Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

(a) Dimensional Stability: 2.0 as per ASTM D-2126

(b) Linear Coefficient of thermal expansion: 2.7 x 105.

(c) Flame Spread: 5 as per ASTM E-84.

(d) Smoke Developed: 45-175 as per ASTM E-84.

(e) Oxygen Index: 24 Min. as per ASTM D-2863.

h. Products: [Owens Corning “High Performance Foamular 250”] 2”x 48”x 96”, T&G, R-10 for metal stud backup application. and 2”x 16”x 96” R-10 for masonry backup application.

F. Cavity Insulation Joint Sealing Tape: Rubber asphalt membrane. 40 mil thick, consisting of 36 mil self-adhering rubberized asphalt membrane laminated to a 4 mil high density polyethylene film and removable release sheet.

1. Minimum width: 4”

a. Primer: As recommended by the manufacturer for application over extruded polystyrene insulation.

G.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of fins or irregularities.

3.2 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing slab.

3.3 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and ceiling spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Retain insulation batts in place with spindle fasteners at 12 inches on center.

E. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member

F. Tape seal tears or cuts in vapor retarder.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.5 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 5010
MODIFICATIONS TO EXISTING ROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Modification to existing EPDM membrane roofing system.

B. The existing roof is under warranty. Coordinate with Construction Manager for further information.
   1. Contractor must notify and be authorized by the manufacturer to perform all work as per the manufacturer's instruction.

C. Cut new openings and install curbs.

D. Fill in abandoned equipment openings.

E. Disposal of removal and debris construction waste and dispose in manner complying with all applicable federal, state, and local regulations.

F. Install new isocyanurate insulation, cover board, fully adhered 60 mil thick fire rated EPDM roofing, and flashings as indicated or required.

G. Clean all residual material from substrate surfaces and the flutes of any exposed steel deck - prior to installing new insulation and roofing. Install new insulation, roofing and flashings only on dry smooth surfaces.

H. Provide any hoisting for their work as required as needed, to remove, adjust, modify, reset and reconnect all roof-mounted and roof-penetrating devices to enable new roofing and flashings to be installed. Coordinate with mechanical and electrical prime contractors.

I. Roof top mechanical equipment work is specified in Division 22, 23, and 26 and shown on mechanical and electrical drawings Coordinate with the mechanical & electrical prime contractors to set new curbs and equipment, and/or make modifications to the existing curbs and equipment; prior to installing new roof flashings as indicated.

J. Abandoned mechanical equipment and support curbs will be removed by the mechanical contractors.

K. Maintain building watertight at all times.

L. Install new support steel and decking; insulation to finish flush with existing the deck substrate, new insulation and roofing to make the building permanently watertight.

M. Comply with the published recommendations and instructions of the roofing membrane manufacturer.

N. Commencement of work shall constitute acknowledgement by Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.3 RELATED REQUIREMENTS

A. Section 06 1010 - Roof Related Rough Carpentry Wood nailers associated with roofing and roof insulation.

B. Section 07 6200 - Sheet Metal Flashings and Specialties

C. Sectoin 07 7200 Roof Accessories.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 for definition of terms related to roofing work not otherwise defined in the section.

1.5 REFERENCE STANDARDS

A. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2018a.

D. ASTM D1079 - Standard Terminology Relating to Roofing and Waterproofing; 2016.

E. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

G. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2016.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Before start of roofing work, General Construction Contractor and Installer shall hold a meeting to discuss the proper installation of materials, status of the existing warranty and requirements to maintain the existing warranty.
   1. Notify Owner's Representative well in advance of meeting.
   2. Review all locations required for modifications to existing roofing.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Submit a pre-work site and building inspection with photos to document conditions before any other work starts.

C. Product Data:
   1. Provide manufacturer's printed data sufficient to show that all components of roofing systems, including insulation and fasteners, comply with the specified requirements and with the roofing manufacturer's requirements and recommendations for the system type specified; include at least the following:
      a. Technical data sheet for roof membrane.
      b. Technical data sheets for splice tape and adhesives.
      c. Technical data sheet for each insulation type.
      d. Technical data sheet for each cover board type.
      e. Technical data sheet for pavers.
   2. Written certification from the existing roofing manufacturer which states that the installer is acceptable or licensed to install or modify the existing roofing system, and that the warranty will remina in effect; if not previously provided.

D. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications for all systems under warranty.

1.8 CODE APPROVAL REQUIREMENTS

A. Install roofing and insulation system components to meet the following minimum requirements:
   1. New York State Uniform Fire Prevention and Building Code, which includes by reference the New York State Energy Conservation Code.
   2. Underwriters Laboratories Inc. Class A External Fire Rating for roof assemblies tested in accordance with ASTM E 108 or UL 790.
   3. Minimum wind uplift pressure calculated using ASCE 7 and a safety factor of 2:
      a. Field Zone - 90 psf
      b. Perimeter Zones - 135 psf

c. Corner Zone - 180 psf

B. Provide written certification from the roof material Manufacturer, before beginning work, to confirm the roofing system meets these requirements.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty (20) years of documented experience.

B. Installer Qualifications: Roofing installer shall have the following:

1. A firm (Installer) with not less than five (5) continuous years experience performing EPDM roofing work similar to that required for this project, employing personnel skilled in the specified work.
2. The Installer shall directly employ the personnel performing the work of this section.
3. The Installer shall have a full time supervisor/foreman on the roof when roofing work is in progress. The Supervisor shall have a minimum of five (5) years experience in roofing work similar in nature and scope to this project, and speak fluent English.
4. The Installer shall provide a reference list of at least three projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner's Representative.
5. The Installer shall be acceptable to or licensed by the Manufacturer of the primary roofing materials, and provide written certification from the Manufacturer to confirm this prior to award if requested.

C. Material Quality: Obtain each product, including the insulation, cover board, EPDM roofing and flashing, and cements, primers and adhesives produced by a single Manufacturer, which has manufactured the same products in the United States of America for not less than five (5) continuous years.

D. Pre-Work Conference: Meet at the project site approximately one week prior to starting roof work, with the YPS Office of Facilities Management and other representatives concerned about the work, to discuss the following:

1. How the building will be kept watertight as existing roofing is removed and the work progresses.
2. How new roofing work will be coordinated with mechanical equipment work, replacement of deteriorated existing insulation and the installation of new insulation, cover board, flashings and other items to provide a watertight installation.
3. Generally accepted industry practice, the Manufacturer's instructions for handling and installing his products, and project specific work requirements.
4. The condition of the substrate (deck), curbs, penetrations and preparatory work needed by trades other than the roofer.
5. Submittals, if any remain incomplete.
6. The construction schedule, weather forecast for the work period, availability of materials, personnel, equipment and facilities needed to proceed and complete the work in an expeditious manner and on schedule.
7. A schedule for Manufacturer andYPS Office of Facilities Management inspections.

1.10 JOB CONDITIONS (CAUTIONS & WARNINGS)

A. Do not use oil base or plastic roof cement with EPDM roofing. Do not allow waste products, (petroleum grease or oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with any roofing, insulation or flashing product. Do not expose EPDM roofing and accessories to a temperature in excess of 175 degrees Fahrenheit.

B. Splice cleaner, primer, cements and bonding adhesives are flammable. Do not breathe vapors or use near fire or flame or in a confined or unventilated area. Dispense only from a UL listed or approved safety can.

C. Remove empty adhesive and solvent containers and contaminated rags from the roof and legally dispose of them daily.

D. Do not apply adhesives adjacent to open ventilation system louvers, or windows. Temporarily cover the louvers and windows with 6 mil fire retardant polyethylene and prevent adhesive odors from entering the building. Remove temporary covers at the end of each days work.

1.11 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver material to the site in the Manufacturer's original and unopened packaging, bearing labels which identify the type and names of the products and Manufacturers, with the labels intact and legible.

B. Store all materials in accordance to manufacturer's instructions.

C. Cover all stored materials, except rolls of EPDM and sealed cans of adhesives, with watertight tarpaulins installed immediately upon delivery.

D. Immediately remove any insulation which gets wet from the job site.

E. Do not overload the structure when storing materials on the roof.

F. Store and install all material within the Manufacturer's recommended temperature range.

1.12 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Existing Roof System Under Warranty

1. The existing roofing system is under warranty and the General Construction Contractor or their subcontractor must notify and be authorized by the manufacturer to perform all work as per the manufacturer's instruction.
   a. Manufacture's Warranty: Certification from manufacturer that the existing warranty covering membrane, roof insulation, and other indicated components of the system, shall remain the new and existing terms of the original warranty.
2. Comply with all warranty procedures required by manufacturer, including notifications Manufacture's Warranty: Certification from manufacturer that the existing warranty covering membrane, roof insulation, and other indicated components of the system, shall remain the new and existing terms of the original warranty, scheduling, and inspections:
3. Manufacturer's and Contractor's Guarantees/Warranties shall be issued no more than 30 days before the satisfactory completion of punch list work.

PART 2 PRODUCTS

2.1 GENERAL

A. Acceptable Manufacturer - Roofing System: Match existing manufacturers roofing system.
   1. Roofing systems by other manufacturers are not acceptable if existing roof is under warranty.

B. Substitutions: See Section 01 2500 - Substitution Procedures

2.2 EPDM ROOFING

A. Unreinforced 60 mils thick, fire retardant, EPDM (Ethylene Propylene Diene Monomer) sheet membrane conforming to the following minimum physical properties.

	PROPERTY	TEST METHOD	SPECIFICATION
2.	Color- Gray/Black		
3.	Elongation	ASTM D-412	300% min
4.	Tear Strength	ASTM D-624	150 lb/in min
5.	Ozone Resistance	ASTM D-1149	No cracks, 7 days/100 pphm/100ºF/50% strain
6.	Heat Aging	ASTM D-573	1200 psi min@ 200% elongation/4 wks/240ºF
7.	Brittleness Temperature	ASTM D-746	-49ºF
8.	Water Vapor Permanence	ASTM E-96	2.0 perm max

9.	Thickness	ASTM D-412	60 mils plus/minus 6 mils
10.	Fire Retardant		UL Class A

B. Related Materials:

1. Cleaners, adhesives, sealants, caulking and fasteners furnished by the EPDM system Manufacturer. Use low VOC adhesives and cleaners to comply with regulations in effect at the time of application.
   a. Stripping: 90 mil thick 5 inch and 9 inch wide self adhering flashing, consisting of 45 mils of semi-cured EPDM factory laminated to 45 mils of cured seaming tape.
   b. Bonding Adhesive: High strength contact adhesive.
   c. Splice Adhesive: High strength synthetic polymer based contact cement formulated specifically to splice EPDM sheets.
   d. Lap Sealant: EPDM rubber based gun grade sealant.
   e. Water Block Seal: One component low viscosity butyl rubber sealant.
   f. Pre-Molded Pipe Flashing: Pressure sensitive prefabricated flashings with pre-applied adhesive.
   g. Pourable Sealer: Two component, solvent free polyurethane based sealant.
   h. Reinforced Perimeter Fastening Strips: .030 inch thick reinforced cured EPDM.
   i. Seam Tape Primer: Synthetic rubber polymer based primer designed to clean and prime seam tape spice areas prior to installing the tape.
   j. Seam Splice Tape: Nominal 30 mil thick cured polymer self adhesive tape with release paper carrier, 6 inches wide.
   k. Plates and Bars: Galvanized and corrosion resistant specialty products.
   l. Fasteners: #14 Fluorocarbon polymer coated heavy duty screws.

C. Gypsum Cover Board: 1/4 inch thick fire resistant gypsum board decking inorganic glass mat facers and a water resistant core, formulated in square edge boards, UL Class A, meeting ASTM C-1177, manufactured under the trade name "Dens-Deck Prime"

2.3 INSULATION:

A. Isocyanurate – Tapered rigid cellular polyisocyanurate boards with fibrous felt/fiberglass mat facers, sloping 1/8 inch per foot, (match existing) minimum starting thickness 1-1/2 inches, minimum compressive strength 20 psi, meeting ASTM C1289-01, Type II, Class1, Grade 2.
   1. Crickets sloping 1/4 inch per foot.
   2. At repairs to existing building match thickness of existing insulation.
   3. Product: Firestone “ISO 95+ Isocyanurate Insulation” or approved equal.

2.4 ACCESSORY MATERIALS

A. Cant Strips and Tapered Edge Strips: 45 degree face slope and minimum 5 inch face dimension; provide at all angle changes between vertical and horizontal planes that exceed 45 degrees.
   1. Install using hot asphalt (Type IV), roofing mastic, or mechanically fastened using fasteners and plates approved by roofing manufacturer.

B. Rubber Walkway Pads: 30" x 30"x 1/4". Compatible with existing roofing system.

C. Concrete Pavers: Interlocking, with shiplap edges on all sides and integral radiused bearing pads.
   1. Size: Approximately 30 inches by 30 inches by 1-1/2 inches thick.

PART 3 INSTALLATION

3.1 GENERAL

A. Construct the new roofing system in a watertight, workmanlike manner, meeting the guarantee requirements specified herein; in strict accordance with the drawings and in conformance with the Manufacturer's requirements, except as enhanced in this specification.

B. Clean the surface on which roofing system components will be applied, of all laitance, dirt, oil, grease or other foreign matter which would in any way affect the quality of the installation.

C. Install roof system components on dry surfaces only. Do not install any items when weather conditions and outside temperatures are not suitable in accordance with the Manufacturer's recommendations.

D. Complete all work in sequence as quickly as possible so that as small an area as practicable is in the process of construction at any one time. Complete the entire area of work begun each day, the same day, and make all exposed edges watertight at the end of each day's work.

3.2 SUBSTRATE INSPECTION

A. Remove portions of existing roofing, insulation, and flashings, and carefully check the existing deck and new roof substrate. To be an acceptable surface for the new roofing system, the deck and substrate shall be well secured to the underlying structure, dry and not otherwise deteriorated.

B. Immediately notify the Owner's Representative in writing if defects in the substrate are discovered.

C. Maintain the building watertight in the interim, but do not install new insulation or roofing until substrate defects have been corrected.

3.3 NEW TO EXISTING INTERFACE

A. Remove and replace portions of existing roofing at the construction interface between new construction and existing roof areas.
   1. Install new isocyanurate insulation, mechanically fastened, to match existing insulation thickness and to maintain the slope of the existing insulation.
   2. Install 60 mil. fully adhered EPDM membrane to lap a minimum of 12 inches onto existing EPDM membrane.

3.4 INSULATION AND COVER BOARD

A. Install tapered insulation and crickets, neatly cut at all miters and transitions.
   1. Do not lace corner boards.
   2. Install the crickets under the new insulation

B. Install insulation with joints offset between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.

C. Fasten new and replacement layers of insulation with screws and discs which penetrate through the deck a minimum of 3/4 inch and a maximum of 1-1/2 inches.
   1. Provide number of fasteners as recommended by the manufacturer or the equivalent of:
      a. Install 16 fasteners per 4 by 8 foot insulation board in the field of the roof.
      b. Install 28 fasteners per 4 by 8 foot insulation board in 12 foot wide perimeter zones.
      c. Install 32 fasteners per 4 by 8 foot insulation board in 12 foot square corner zones.
   2. Carefully choose the length and position of each screw to ensure the screws do not protrude through the underside of the deck where visible inside the school.

D. Install gypsum cover board over the insulation with joints offset between rows and the insulation a minimum of 12 inches. Cut gypsum cover board to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.

E. Install all layers of insulation on deck areas and the gypsum cover board, in low rise polyurethane foam adhesive applied in accordance with the Manufacturer's recommendations and to achieve the specified minimum uplift resistance.
   1. Install 1/2 inch diameter adhesive beads spaced 12 inches on center in the field of the roof.
   2. Install 1/2 inch diameter adhesive beads spaced 6 inches on center in 12 foot wide perimeter zones.
   3. Install 1/2 inch diameter adhesive beads spaced 4 inches on center in 12 foot square corner zones.

3.5 PREPARATION

A. Remove all of the existing roof system down to the roof deck including all existing composition base flashings. Dispose of all materials properly. Perform asbestos removal in accordance with federal, state and local regulations and dispose of waste in legal manner.
   1. At penetrations, remove all existing flashings, including lead, asphalt, mastic, etc.
   2. At walls, curbs, and other vertical and sloped surfaces, remove loose and unsecured flashings; remove mineral surfaced and coated flashings; remove excessive asphalt to provide a smooth, sound surface for new flashings.

B. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

C. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

D. Fill all surface voids in the immediate substrate that are greater than 1/4 inch wide with fill material acceptable insulation to membrane manufacturer.

E. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

3.6 VAPOR RETARDER

A. Before installing insulation install vapor retarder directly over the deck to match existing, if present.

B. Ensure that all penetrations and edge conditions are sealed to prevent moisture and air drive into the roofing system.

3.7 INSULATION AND COVER BOARD INSTALLATION

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install insulation in a manner that will not compromise the vapor retarder integrity.

C. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch.

D. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by membrane manufacturer.

3.8 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Install membrane adhered to the substrate, with edge securement as specified.

E. Fully adhere EPDM to the substrate with bonding adhesive, .
   1. Allow contact bonding adhesive to dry to the touch EPDM before joining the EPDM to the substrate. Roll the EPDM onto the bonding adhesive and immediately rub it vigorously with a soft bristle broom to ensure complete adhesion.
   2. Do not punch holes in cans of adhesive and use them in a “Better Spreader” without first opening the cans to mix them.
   3. Replace used roller covers each day; discard covers after each days use.
   4. Allow bonding adhesive to dry to the touch before joining the PVC to the substrate.
   5. Allow bonding adhesive to dry to the touch before joining the EPDM to the substrate.

F. Roofing installed over improperly applied adhesive or with adhesive that wasn't stirred, and roofing installed with blisters, ridges, mole runs and similar deficiencies shall be removed and replaced at the Contractor's expense

G. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.

H. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.

3.9 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls and curbs and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing high above membrane surface or as shown on drawings.
   1. Use the longest practical flashing pieces.
   2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
   3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
   4. Provide termination directly to the vertical substrate as shown on roof drawings.

C. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
   1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
   2. Structural Steel Tubing: If corner radii are greater than 1/4 inch and longest side of tube does not exceed 12 inches, flash as for pipes; otherwise, provide a standard curb with flashing.

3.10 FINISHING AND ACCESSORIES INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
   1. Use concrete pavers.

B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch and maximum of 3.0 inches from each other to allow for drainage.
   1. If installation of walkway pads over field fabricated splices or within 6 inches of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches on either side.
   2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

3.11 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

B. Perform all corrections necessary for issuance of warranty.

3.12 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.13 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

SECTION 07 5300
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings.

B. Remove and legally dispose of existing EPDM roofing, insulation, base sheet, flashing, and accessories as required.

C. Clean all debris & material from the surface of the deck.

D. Inspect the underside of the roof deck daily to insure no items will not interfere with work.
   1. Remove, replace, relocate all items as required.

E. Elastomeric roofing membrane, ballasted conventional and ballasted protected membrane application.

F. Insulation, flat and tapered.

G. Install new insulation, EPDM roofing, and flashings, to modify or replace existing roofing where new construction where indicated. Utilize components approved or reccommended by manufacturer required to maintain the existing manufacturer's warranties.
   1. All work on existing warrantied roof areas shall not commence until Manufacturer approves the installer in writing.

H. Cover boards.

I. Flashings.
   1. All roof drains.
   2. All roof mounted or roof-penetrating equipment.
   3. All other areas indicated on drawings

J. Roof pavers systems.

K. Roof drains.

L. Repair deterioration less than 1/2 inch deep in the surface of the existing concrete deck using fast setting concrete grout.

M. Replace deteriorated portions of existing substrate as required.

N. Maintain the building constantly watertight as work occurs.

O. Protect existing and new roof surfaces when material and equipment is placed and where construction traffic occurs.
   1. Proved 6 mil fire retardant polyethylene covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 04 0100 - Maintenance of Masonry

C. Section 06 1010 - Roof Related Rough Carpentry.

D. Section 07 6200 - Sheet Metal Flashing and Trim:.

E. Section 07 7200 - Roof Accessories: Roof-mounted units.

F. Division 23 Plumbing: Roof drains

1.4 REFERENCE STANDARDS

A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2018a.

C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

D. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2012).

E. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2014.

F. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

I. NRCA (RM) - The NRCA Roofing Manual; 2018.

J. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

K. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

L. UL (FRD) - Fire Resistance Directory; Current Edition.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; the full time supervisor-foreman the Owner's Representative roof system Manufacturer's representative, and other representatives concerned about the roof to review preparation and installation procedures and coordination and scheduling necessary for related work. Items to be discussed, include the following:

1. How the application of the new roofing system will be coordinated with the removal of the old roof, the inspection of and repairs to the deck, installation of wood blocking, roof insulation, crickets, roof drains, and metal and/or membrane flashing and the procedures to provide a watertight installation.
2. Repairs to existing roof system.
3. Commercial practice and the Manufacturer's instructions for handling and use of materials.
4. The expected condition of the roof deck, drains, curbs, penetrations and other preparatory work needed and/or performed by other trades.
5. Manufacturer's instructions for handling and installing the products.
6. Submittals, both completed and yet to be completed.
7. The construction schedule, material availability, crew size and work hours, equipment and facilities needed to make progress and avoid delays.
8. A schedule for Manufacturer and Owner's Representative inspections.
9. Expected weather conditions, and procedures for coping with unfavorable weather

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Submittals shall be prepared and made by the firm that will perform the actual work.

C. Provide electronic submittals via an on-line submittal exchange program if one is established for this project; if an on-line program isn't established, provide the submittals on portable USB drives in pdf format, organized in folders by Section.

D. Submit a pre-work site and buiding inspection report with photos to document conditions before any other work starts.

E. Written certification from the Manufacturer which states that the Installer is acceptable or licensed to install the specified roofing.
   1. Provide this prior to contract award.
   2. Building inspection report with photos to document conditions prior to starting work on site.

F. Product Data: Provide technical product data indicating membrane materials, flashing materials, insulation, fasteners, and roof accessories.

G. Installation Instructions for all roofing system components.

H. Shop Drawings: Roofing system shop drawings, made or approved by employees or representatives of the system Manufacturer, which show the roof outline and size, for roof replacement, location, type and flashing, method for penetrations, and eave and perimeter flashing configurations.
   1. Shop drawings shall be approved by the Manufacturer before they will be reviewed and approved by the Owner's Representative and Architect.

I. Samples of the Contractor's and Manufacturer's guarantee/warranty.

J. Material Safety Data Sheets:
   1. Simultaneously provide all Material Safety Data Sheets needed for this project, for all specification sections-collated by section, in three ring binders.
   2. Provide one binder for each building/school.

K. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

L. Manufacturer's Installation Instructions: Indicate perimeter conditions requiring special attention.

M. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

N. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

O. Testing firm's qualification statement.

P. Warranty: Submit manufacturer warranty and ensure forms have been completed in Edgemont School District's name and registered with manufacturer.

Q. Payment requisitions will not be processed until all submittals are received and approved.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years of documented experience, providing primary products, including roof membrane, insulation, fasteners, flashing, and adhesives, produced by a single Manufacturer. Provide secondary products only as recommended by the Manufacturer of the primary products.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience, and approved by manufacturer.
   1. The Installer shall provide a reference list of at least five projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner's Representative:
      a. The reference list shall include at a minimum, the completion date, type of system, Manufacturer, square foot size, Owner's name - contact person - phone number and address and Architect's name - contact person and phone number.
   2. The Installer shall provide the reference list prior to contract award if requested.
   3. The Installer shall directly employ the personnel performing the work of this section.
   4. The Installer shall be acceptable to or licensed by the Manufacturer of the primary roofing products.

5. Installer's Field Supervision: Maintain a full time supervisor-foreman on the roof when roofing work is in progress. The supervisor shall have a minimum of 5 years experience installing EPDM roofing, and speak fluent English.

D. Testing Firm Qualifications: Company specializing in performing work of the type specified and approved by manufacturer.

1.8 CODE APPROVAL

A. Install roofing and insulation system components to meet the following minimum requirements:
   1. New York State Uniform Fire Prevention and Building Code.
   2. Underwriters Laboratories Inc. Class A fire rating for Roof Covering Materials.
   3. ASCE 7-05 minimum uplift resistance, using a safety factor of 2:
      a. Field Zone-60 psf
      b. Perimeter Zones - 100 psf
      c. Corner Zone - 150 psf.
   4. Provide written certification from the Manufacturer, before beginning work, to confirm the roofing system meets these requirements

1.9 JOB CONDITIONS (CAUTIONS & WARNINGS)

A. Do not use oil or solvent based roof cement with EPDM roofing. Do not allow waste products, (petroleum grease or oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with any roofing, insulation or flashing product. Do not expose EPDM roofing and accessories to a temperature in excess of 175 degrees Fahrenheit.

B. Splice cleaner, primer, cements and bonding adhesives are flammable. Do not breathe vapors or use near fire or flame or in a confined or unventilated area. Dispense only from a UL listed safety can or the Manufacturer’s original container.

C. Remove empty adhesive, cleaner and solvent containers and contaminated rags from the roof and legally dispose of them daily.

D. Do not apply primer, cleaners or adhesives next to ventilation system louvers or windows. Temporarily cover the louvers and windows with 6 mil fire retardant polyethylene and prevent odors from entering the building. Remove temporary covers at the end of each days work

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Store and install all material within the Manufacturer's recommended temperature range.

E. Protect foam insulation from direct exposure to sunlight.

F. Immediately remove any insulation which gets wet from the job site

G. Do not overload the structure when storing materials on the roof.

1.11 FIELD CONDITIONS

A. Do not use oil base or plastic roof cement with EPDM roofing. Do not allow waste products, (petroleum grease or oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with any roofing, insulation or flashing product. Do not expose membrane and accessories to a temperature in excess of 175 degrees Fahrenheit

B. Splice cleaner, primer, cements and bonding adhesives are flammable. Do not breathe vapors or use near fire or flame or in a confined or unventilated area. Dispense only from a UL listed or approved safety can.

C. Remove empty adhesive and solvent containers and contaminated rags from the roof and legally dispose of them daily.

D. Do not apply adhesives adjacent to open ventilation system louvers, or windows. Temporarily cover the louvers and windows with 6 mil fire retardant polyethylene and prevent adhesive odors from entering the building. Remove temporary covers at the end of each days work

E. Do not apply roofing membrane during unsuitable weather.

F. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

G. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

H. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.12 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide a written Manufacturer's "Full System Guarantee/Warranty" which warrants that the roofing system, including the insulation, roof membrane and membrane flashings, will remain in a watertight condition for a twenty (20) year period beginning upon Final Completion.

C. Guarantee/Warranty coverage shall remain in effect for gust wind speeds up to 72 miles per hour, measured 30 feet above grade at the site.

1. Guarantee/Warranty coverage may be cancelled, for the affected portion of the roof, if the work is damaged by winds in excess of 72 mph, by hail, lightning, insects or animals, by failure of the structural substrate, by exposure to harmful chemicals, by other trades on the roof, or by vandalism, or if the Owner fails to maintain the roof in accordance with, or makes roof alterations contrary to, the Manufacturer's printed recommendations.
2. Guarantee and Warranty coverage shall be reinstated, for the remainder of the original period; if the Owner restores the roof to the condition it was in prior to the damage occurring

D. Guarantee and Warranty coverage shall have no dollar value limit

E. Provide a Contractor's written Guarantee which warrants all work will remain free of material and workmanship defects and in a watertight condition for a five (5) year period beginning upon Substaintional Completion.

1. Defective work includes but is not limited to the following types of failure:
   a. Leakage, delamination, lifting, loosening, splitting, cracking, and undue expansion.

F. The Contractor's repairs and modifications under the Guarantees/Warranties shall be made at his Contractor's expense including removing and replacing materials installed as part of the original work, if removal is needed to affect guaranteed repairs.

G. Manufacturer's and Contractor's Guarantees/Warranties shall be issued no more than 30 days before the satisfactory completion of punch list work.

H. Guarantees/Warranties shall include the removal and replacement of items or materials superimposed over the roof membrane as part of the original work, if removal and replacement is needed to effect warranty repairs.

I. Guarantee/Warranty coverage may be cancelled, for the affected portion of the roof, if the work is damaged by winds in excess of 72 mph, by hail, lightning, insects or animals, by failure of the structural substrate, by exposure to harmful chemicals, by other trades on the roof, or by vandalism, or if the Owner fails to maintain the roof in accordance with, or makes roof alterations contrary to, the Manufacturer's printed recommendations.

J. Guarantee/Warranty coverage shall be reinstated, for the remainder of the original period, if the Owner restores the roof to the condition it was in prior to the damage occurring.

K. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.

1.13 SUBSTITUTIONS

A. Substitutions: See Section 01 2500 Substitution Procedures for additional. requirements.

B. The following factors will be considered when evaluating a possible alternative to the roofing system specified:
   1. The wording and intent of the warranty to be issued.
   2. The financial status, numbers of years in business, and stability of the entity that will issue the warranty.
   3. A reference list of at least three completed similar projects of comparable size, with a successful functional history of at least five years, within an approximate fifty mile radius of the Project.
   4. Technical aspects of the system, especially relating to durability, serviceability and performance.
   5. The capacity and history of the Manufacturer in providing technical response, on-site inspections and assistance.
   6. The availability and prior experience of local authorized applicators to install and maintain the proposed alternate system.
   7. The willingness and history of the Manufacturer in responding to warranty claims previously made by the Owner, Owner's Representative, and Architect involved in this project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. EPDM Membrane Roofing:
   1. Carlisle SynTec: www.carlisle-syntec.com.
   2. Firestone Building Products, LLC: www.firestonebpco.com/#sle.
   3. Johns Manville: www.jm.com/#sle.

B. Substitutions: See Section 01 2500 Substitution Procedures.

2.2 PRIMARY PRODUCTS

A. Primary products required for this project include:
   1. Vapor barrier
   2. Roof insulation
   3. Cover board
   4. EPDM roofing
   5. Primers and adhesives
   6. Sealants
   7. EPDM flashing
   8. Fasteners

2.3 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); non-reinforced; complying with minimum properties of ASTM D 4637.
   1. Thickness: 0.060 inch (60 mil).
   2. Sheet Width: 120 inch, minimum; factory-fabricate into largest sheets possible.
      a. Adhered Application: Limit width to 120 inches, maximum, when ambient temperatures are less than 40 degrees F for extended period of time during installation.
   3. Color: Black.
   4. Tensile Strength: 1305 psi, measured in accordance with ASTM D412.
   5. Ultimate Elongation: 300 percent, measured in accordance with ASTM D412.
   6. Tear Strength: 150 lbf per inch, measured in accordance with ASTM D624.

7. Water Vapor Permeability: 2.0 perm inch, measured in accordance with ASTM E96/E96M.
8. Brittleness Temperature: -49 degrees F, measured in accordance with ASTM D746.
9. Ozone Resistance ASTM D-1149 No cracks,7 days/100 pphm/100ºF/50% strain
10. Heat Aging ASTM D-573 1200 psi min@ 200%.
11. Fire Retardant: UL Class A.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Membrane Fasteners: As recommended by membrane manufacturer.

D. Stripping: 90 mil thick 5 inch and 9 inch wide self adhering flashing, consisting of 45 mils of semi-cured EPDM factory laminated to 45 mils of cured seaming tape.

E. Bonding Adhesive: High strength neoprene based contact adhesive.

F. Splice Adhesive: High strength synthetic polymer based contact cement formulated specifically to splice EPDM sheets.

G. Lap Sealant: EPDM rubber based gun grade sealant.

H. Water Block Seal: One component low viscosity butyl rubber sealant.

I. Pre-Molded Pipe Flashing: Pressure sensitive prefabricated flashings with pre-applied adhesive.

J. Pourable Sealer: Two component, solvent free polyurethane based sealant.

K. Reinforced Perimeter Fastening Strips:.030 inch thick reinforced cured EPDM.

L. Seam Tape Primer: Synthetic rubber polymer based primer designed to clean and prime seam tape spice areas prior to installing the tape.

M. Seam Splice Tape: Nominal 30 mil thick cured polymer self adhesive tape with release paper carrier, 6 inches wide.

N. Plates and Bars: Galvanized and corrosion resistant specialty products.

O. Fasteners: Provide fasteners that meet the specified wind uplift requirements, and as recommended by the roofing system manufacturer suitable for fastening into the existing decks.

P. Primer & Vapor Barrier:
1. Primer: Thin, cut back asphalt meeting ASTM D41.
2. Vapor Barrier: Fire resistant torch grade SBS modified granular surfaced polyester and glass scrim reinforced cap sheet meeting ASTM D 6163 Type I, Grade G, furnished by the same manufacturer as the EPDM

2.4 COVER BOARDS

A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
1. Water resistant core
2. Size: 48 by 48 inch square edge boards.
3. UL Class A rated,
4. Thickness: 1/4 inch, fire-resistant.
5. Products:
a. Georgia-Pacific; DensDeck Prime Roof Boards with EONIC Technology: www.densdeck.com/#sle.
b. Substitutions: Section 01 2500 Product Substitutions.

2.5 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
1. Classifications:
a. Type II: Faced with either cellulosic facers or glass fiber mat faces on both major surfaces of core foam

a) Class 2 - Faced with coated polymer-bonded glass fiber mat facers on both major surfaces of core foam.
b) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.
c) Thermal Resistance, R-value: At 1-1/2 inches thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F.

2. Board Size: As required.
3. Board Thickness: 5-1/2 inch minimum thickness and slope indicated on Drawings
4. Tapered Board: Slope 1/8 as indicated; minimum thickness as iindicated on drawings; fabricate of fewest layers possible.
5. Board Edges: Square.
6. Crickets sloping 1/4 inch.
7. Tapered edge strips – high density isocyanurate or wood fiberboard strips installed at the drain sumps, and insulation transition points.
8. Insulation adhesive: Two component low rise polyurethane foam adhesive, installed with a mixing extruding Pace Cart dispenser, or with a pleural heated foam rig. Firestone I.S.O. Adhesive.
9. Products:
   a. Firestone "ISO 95+ Isocyanurate Insulation.
   b. Substitutions: See Section 01 2500 Substitution Procedures.

2.6 ACCESSORIES

A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

B. Sheathing Joint Tape: Paper type, 2 inch wide, self adhering.

C. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.

D. Membrane Adhesive: As recommended by membrane manufacturer.
1. Use insulation adhesive suitable for application at the intended application temperatures.
2. Do not use twin cartridge “caulking gun” adhesive except on very small isolated sections of roof
3. Firestone I.S.O. Adhesive or equal.

E. Insulation Adhesive: When approved, in writing, by the manufacturer adhesive may be used in lieu of mechanically fastening insulation to substrate.
1. Two component low rise polyurethane foam adhesive, installed with a mixing extruding Pace Cart dispenser, or with a pleural heated foam rig.
2. Use insulation adhesive suitable for application at the intended application temperatures.
3. Do not use twin cartridge “caulking gun” adhesive except on very small isolated sections of roof.
4. Manufacturer:
   a. ISO Twin Pak manufactured by Firestone.
5. Substitutions: See Section 01 2500 Substitution Procedures.

F. Insulation Perimeter Restraint: Stainless steel edge device configured to restrain insulation boards in position and provide top flashing over ballast.

G. Concrete Grout: Fast setting Portland cement based polymer modified repair mortar as manufactured by the Quikcrete Companies, under the trade name Quick-setting cement or equal.

H. Sealants: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.2 SUBSTRATE INSPECTION

A. Remove existing roofing, insulation, flashings, underlayment material, and the base sheet where indicated on the drawings, and carefully check the existing deck. To be an acceptable surface for the new roofing system, it is to be well secured to the underlying structure and not rotted or otherwise deteriorated.

B. Carefully inspect the roof deck before beginning work. To be an acceptable surface for the new roofing system, it is to be well secured to the underlying structure and not otherwise damaged of deteriorated.

C. Immediately notify the Owner's Representative by telephone and in writing if defects in the substrate are discovered.

3.3 DECK REPAIR

A. Concrete deck repairs:

1. Perform repairs to the surface of concrete deck areas, 1/2 inch or less in depth, with quick setting non-shrink grout under the Base Bid.
2. Deterioration greater than 1/2 inch deep shall be brought to the Owner's Representative attention for his review and direction

3.4 VAPOR BARRIER

A. Install primer and a vapor barrier on the concrete deck: install the primer and allow it to dry.

B. Starting at the low point, torch apply and fully adhere modified bitumen vapor barrier sheets to the primed substrate. Lap sheets at least 4 inches at the ply overlaps and at least 6 inches at the end laps.

C. Carefully install the vapor barrier sheets to achieve only the minimum required bleed out.

D. Extend vapor barrier up vertical surfaces at the roof perimeter, and up and around all penetrations and curbs, and seal the vapor barrier to provide continuity of the building air/vapor envelope.

3.5 INSULATION AND COVER BOARD

A. Install tapered insulation neatly cut at all miters and transitions. Do not lace corner boards.

B. Install insulation with joints offset between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.

C. Install all layers of insulation and the cover board using low rise polyurethane foam adhesive applied in accordance with the Manufacturer’s recommendations and to achieve the specified minimum uplift resistance. Offset joints in the insulation and cover board between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.

1. Install 1/2 inch diameter adhesive beads 12 inches on center in the field of the roof.
2. Install 1/2 inch diameter adhesive beads 6 inches on center in 12 foot wide perimeter zones.
3. Install 1/2 inch diameter adhesive beads 4 inches on center in 12 foot square corner zones.
4. Place 5 gallon pails half full of gravel or concrete on the insulation and gypsum cover boards to hold them firmly in position for at least 15 minutes while the low rise foam adhesive sets. Position the pails no more than 24 inches apart in all directions.
5. Insulation and cover board installed without using pails of gravel or concrete ballast shall be removed and replaced at the Contractors expense

3.6 INSTALLATION - MEMBRANE

A. Install elastomeric membrane roofing system in accordance with manufacturer's recommendations and NRCA (WM) applicable requirements.

B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

C. Shingle joints on sloped substrate in direction of drainage.

D. Install tapered insulation neatly cut at all miters and transitions. Do not lace corner boards.

E. Install insulation with joints offset between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch

F. Fully Adhered Application: Apply adhesive to substrate at rate of 1.5 gal/square. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
   1. Open each can of adhesive and stir it with an electric paddle mixer for at least 5 minutes before applying the adhesive. Re-stir adhesive that isn't used within two hours of initial mixing
   2. Do not punch holes in cans of adhesive and use them in a "Better Spreader" without first opening the cans to mix them.
   3. Replace used roller covers each day; discard covers after each days use
   4. Allow bonding adhesive to dry to the touch before joining EPDM to substrate. Roll the EPDM onto the dried bonding adhesive and immediately rub it vigorously with a soft bristle broom to ensure complete adhesion

G. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

H. Mechanical Attachment: Install membrane and mechanical attachment devices in accordance with manufacturer's instructions.

I. EPDM installed over improperly applied adhesive or with adhesive that wasn't stirred, and roofing installed with blisters, ridges, mole runs and similar deficiencies shall be removed and replaced at the Contractor's expense. Removal shall include the insulation and cover board assembly

3.7 SPLICING

A. Form all membrane splices with 6 inch wide seam tape or with 3 inch wide factory applied seam tape.
   1. Fold the top sheet back about 10 inches. Clean both mating surfaces using clean rags with splice wash.
   2. Scrub a smooth coat of QuickPrime to both mating surfaces, with long strokes obtaining complete coverage, using approximately 1 gallon per 225 square. Do not allow the QuickPrime to glop, streak or puddle. Allow it to dry to the touch before installing the seam tape.
   3. Install the seam tape on the bottom sheet of EPDM membrane, using guide marks to position it so 1/8 inch minimum and 1/2 inch maximum will be exposed out of the seam when the seam is complete.
      a. Install 5 inch uncured EPDM stripping over any seam where the tape is exposed less than 1/8 inch or more than 1/2 inch.
   4. Roll and allow the top sheet to fall freely into place without stretching or wrinkling it.
   5. Pull the splice tape release paper from within the seam area and neatly mate the seam using hand pressure to rub the membrane together.
   6. Immediately roll the splice with a 2 inch wide roller, using positive pressure, toward the outer edge of splice.
   7. Install uncured EPDM surface patches with rounded corners, over all T-Seam intersections.
   8. Install 5 inch uncured EPDM stripping over any seam where the tape is exposed less than 1/8 inch or more than 1/2 inch.

B. Install uncured EPDM target patches with rounded corners, over all T-Seam intersections.

3.8 PERIMETER FASTENING

A. Secure the membrane at the perimeter of each roof level, and at eaves, penetrations, expansion joints and slope changes greater than 1 inch in 12 inches. Secure discs through the membrane or adhere it to continuous reinforced EPDM fastening strips. Fasten the discs and EPDM strips 12 inches on center.

3.9 FLASHING

A. At intersections with vertical surfaces:

B. Utilized cured EPDM for all flashings; utilize self-curing EPDM at corners and angle changes only where required by the Manufacturer.
   1. Form flashing splices, and the splice between the flashing and main roof sheet with 7 inch seam tape.
   2. Adhere the flashing to vertical surfaces with bonding adhesive.
   3. Fasten the top edge of all flashings, positioning the fasteners 12 inches on center, to be covered by the cap flashing

C. Install premolded pipe flashings wherever possible. Where premolded pipe flashings cannot be installed, use field wrapped flashings. Install pitch pockets as a last resort.

D. Remove existing pipe flashings and Kennedy type couplings and extend the vent pipes to finish a minimum of 18 inches above the roof surface
   1. Extend the pipes using the same type of pipe material as the original vent pipe.
   2. Use threaded or no-hub couplings, positioned within the insulation layer to extend the pipes.

E. At gravel stops, extend membrane under gravel stop and to the outside face of the wall.

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Coordinate installation of roof drains and related flashings.

3.10 WALK PADS

A. Install walkway pads to create service paths 30 inches wide from roof access points to and around all mechanical equipment, and around at all roof access doors, ladders and hatches. Space pads 3 inches apart to permit drainage.

B. Refer to Section 07 7200 - Roof Accessories.

3.11 DUCT WRAP WATERPROOFING

A. Inspect the ducts and remove any residual tape or other debris from their surfaces before wrapping them. Cover the ductwork with isocyanurate insulation and fully adhered 60 mil thick EPDM roofing.
   1. Install EPDM cover strips and target patches to seal all duct air leaks before installing the insulation. .
   2. Install flat 3 inch thick insulation on the sides and bottom of the ducts.
   3. Install tapered insulation sloping 1/4 inch per foot, minimum-starting thickness 3 inches, on top of the ducts.
   4. Secure the isocyanurate insulation with screws and plates, installed at the rate of one fastener per 2 square feet.
   5. Cover the insulation with fully adhered 60 mil fire retardant EPDM.
   6. Install two roller applied coats of acrylic color coating on the EPDM duct cover.

3.12 MISCELLANEOUS

A. Provide any miscellaneous roofing, flashing, caulking, and metal work needed to leave the work complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner.

B. Use mechanics skilled and licensed in the trades to perform mechanical and electrical work. Provide new material, couplings, transition pieces, blocking, fasteners and the like needed to complete the work

3.13 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Edgemont School District will provide testing services, and Contractor to provide temporary construction and materials for testing.

C. Require site attendance of roofing and insulation material manufacturers during installation of the Work as follows:
   1. First inspection during the first day of new roof installation.
   2. Second inspection when roofing is approximately 50% complete.

3. Final inspection at the completion of all work.
4. Provide 48 hours advance written notice to the Owner's Representative so he may have a representative attend the inspections.
5. Submit the inspection reports within one week following each inspection.

D. Payment requisitions will not be reviewed nor approved until the inspection reports are submitted and reviewed by the Engineer.

E. Provide 48 hours advance written notice to the Architect, so he may have a representative attend the inspections

3.14 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any existing leak or damage, prior to performing any other work on site.

B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leakage or damage which was not documented in the Contractor’s report, or repaired to the Owner's satisfaction at the Contractor’s expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. Clean up all litter, refuse, rubbish, scrap materials and debris at least twice a day; at noon and at the end of the work day, so the roof and site presents a neat, orderly and workmanlike appearance. Place the debris in a dumpster, and remove the dumpster from the site as soon as it is full or no longer being used.

F. Carefully and thoroughly clean the entire roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.15 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHINGS AND SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Sheet metal work that is compatible with the roofing systems specified, including cap and through wall flashings, hook strips, fascia, drip edges, gravel stops, factory fabricated roof edge systems, batten seam panels and caps, and miscellaneous flashings.

1.3 RELATED DOCUMENTS

A. Section 04 0100 - Maintenance of Masonry

B. Section 06 1010 - Roof Related Rough Carpentry.

C. Section 07 5323 - EPDM Roofing.

D. Section 07 7200 - Roof Accessories.

1.4 CODE APPROVAL REQUIREMENTS

A. Fabricate and install roof perimeter flashings that comply with the NY State Uniform Fire Prevention and Building Code and with ANSI/SPRI ES-1 “Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems” requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with at least 5 continuous years experience performing sheet metal work similar to that required for this project, employing personnel skilled in the work specified.
    a. Installer shall be approved by the manufacturer of the existing warranty.
2. The Installer shall directly employ the personnel performing the work of this section.
3. The Installer shall have a full time supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience with work similar in nature and scope to this project, and speak fluent English.
    a. Submit the supervisor’s resume upon request.
4. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner:
    a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner’s name - contact person - phone number and address and the Architect’s name - contact person and phone number.
    b. The Installer shall provide the reference list prior to contract award if requested.

B. Material Quality:

1. Obtain each product from a single Manufacturer which has manufactured the same product in the United States of America for not less than 5 continuous years.
2. Obtain copper and pre-finished sheet metal items from the same mill run to maintain consistent color hue and surface finish
3. Obtain material from manufacturer maintaining warranty.

C. Pre-Construction Conference: Meet at the project site between one and two weeks prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:

1. How the building will be kept watertight as work progresses.
2. How sheet metal work will be coordinated with the installation of the vapor barrier, thermal barrier, insulation, cover board, roofing, flashings, roof accessories and other items to provide a watertight installation.
3. Generally accepted industry practice and the Manufacturer's instructions for handling and installing his products.
4. The condition of the substrate, curbs, penetrations and other preparatory work needed.
5. Incomplete submittals; note that progress payments will not be processed until all submittals are received and approved.
6. The construction schedule, weather forecast, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
7. A schedule for Manufacturer and Owner's representative and Architect/Engineer inspections.

1.6 SUBMITTALS

A. Submit the following items far enough in advance to obtain approval prior to performing any work:
   1. A pre-work site and building inspection report with photos to document conditions before any other work starts on site.
   2. Manufacturer's technical literature for all materials.
   3. Test reports and certifications substantiating compliance with specification requirements if requested by the Owner's Representative and Architect.
   4. Shop drawings or 2 foot long samples of each sheet metal item, to show how it will fit on adjoining masonry and wood blocking assemblies, and with the roof, stripping, and flashings.
   5. 6 inch square pieces of each type of sheet metal to show surface finish, texture and color.
   6. Sample of the Contractor's guarantee form.

B. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
   1. Submittals shall be prepared and made by the firm that will perform the actual work.
   2. Provide electronic submittals via an on-line submittal exchange program if one is established for this project; if an on-line program isn't established, provide the submittals on portable USB drives in pdf format, organized in folders by Section

C. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders for each building to the Owner and Owner's Representative'

D. Payment requisitions will not be processed until all submittals are received and approved.

1.7 JOB MOCK-UPS

A. After the submittals are approved, prepare in actual job locations, mock-ups of cap and through wall flashings, hook strips, drip edges, fascia, gravel stops, factory fabricated roof edge systems, copings, gutters, leaders, and all other items of sheet metal and related work, for inspection and approval by the Owner's Representative and Architect.

B. Construct each mock-up of two full lengths of metal, fastened, connected and stripped-in to the related roofing system, to show the following:
   1. Type, gauge, color, cross-sectional dimensions and shape, and joint and mitering techniques.
   2. Related masonry work, wood blocking, and the attachment techniques and fasteners for all wood and metal components.
   3. Other sheet metal related materials and their installation techniques to fully define the detailing of each mock-up.

C. Mock-ups shall be constructed to establish the minimum standard of materials and workmanship, and to assure that completed work which matches the mock-ups will be fully functional and serve the purpose for it has been designed.

D. Approved mock-ups may be left in place and incorporated into the permanent installation. Rejected mock-ups shall be removed and replaced until an acceptable mock-up is approved.

E. Do not purchase or fabricate sheet metal items until mock-up installation, inspection and approval are completed and approval is documented in writing.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver material to the site in the Manufacturer's original and unopened packaging, with intact and legible labels which identify the products and Manufacturers.

B. Cover all stored materials with watertight tarpaulins installed immediately upon delivery.

C. Do not overload the structure when storing materials on the roof.

D. Protect existing and new roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

1.9 GUARANTEE

A. A. Provide a written Contractor's Guarantee which guarantees that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:

1. Defects include but are not limited to the following: peeling paint, leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, and undue expansion.
2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
3. Guarantee coverage shall include removing and replacing materials installed as part of the original work, if removal is needed to affect guaranteed repairs.
4. Guarantee coverage shall have no dollar limit.

B. Provide one Contractor’s Guarantee that covers “all work performed” when a single contractor is awarded work specified in multiple Sections.

C. The Guarantee coverage shall take affect no more than 30 days before the completion of all punch list work.

D. The Contractor’s Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor’s Guarantee

PART 2 PRODUCTS

2.1 MATERIALS

A. Copper sheet: ASTM B370, 99.0 % pure copper, thickness 16 ounces per square foot. Use copper for all metal items not otherwise indicated

B. Zinc-Tin coated copper: copper sheet, coated on both sides, with a smooth uniform coating of zinc and tin, base metal weight 16 ounces per square foot, cold rolled temper, available as Freedom Gray Copper by Revere.

C. Solder:50-50 tin and lead for plain copper, supplied in one pound bars with the alloy mixture stamped into the bar by the Manufacturer.

D. Flux: Water-Soluble Liquid Flux, Kester #3345 for iron soldering of brass and copper.

E. Aluminum cap flashings and miscellaneous trim: #3105-H14 alloy aluminum, minimum thickness .040 inches unless otherwise indicated, factory finished with a Fluoropolymer Kynar 500 finish, color as selected by the Architect, from the full range of custom and standard colors.

F. Fasteners: Stainless steel, or to match the sheet metal being fastened.

G. Glass Cloth: Open mesh glass fabric coated on each side with plasticized asphalt.

1. Produce: Karnak Corporation.

H. Asphalt Cement: Federal Specifications SS_C153B, Type 1, asbestos free grade.

I. Sealant: High performance, solvent free, formulated and moisture curing silyl-terminated polyether sealant, ASTM C-920, Type S, Grade NS, Class 25, NovaLink construction sealant by ChemLink, color as selected.

J. Fabricate each unit in shop to the greatest extent possible.

PART 3 EXECUTION

3.1 GENERAL

A. Accurately reproduce the details and design shown, and form profiles, bends and intersections, sharp, true and even. Fabricate sheet metal in the shop whenever possible, and form joints, laps, splices and connections to shed water and condensation in the direction of flow.

B. Provide any miscellaneous flashing and sheet metal work not shown on the drawings but otherwise needed to leave the project complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner.

3.2 INSPECTION

A. Examine surfaces to receive work of this section and report any defects to the Owner. Commencement of work will be construed as complete acceptance of surfaces.

3.3 INSTALLATION

A. Fabricate and install copper work in accordance with the current edition of "Copper and Common Sense" as published by the Revere Copper and Brass Company, unless otherwise indicated.
   1. Form all joints, except loose locked sealant filled expansion joints, to overlap 2 inches.
   2. Secure the joints with rivets spaced 1 inch on center positioned about 1/2 inch from the top edge of the joint, then sweat solder the joint.
   3. Use solder only to fill and seal the joint, not for mechanical strength. Form soldered joints continuous, strong and free from defects, with well heated soldering irons. Do not use open flame torches for soldering.
   4. Clean soldered joints daily, immediately after soldering, by washing them with soap and water applied with a soft bristle brush, then rinsing with clear water.

B. Securely fasten and anchor all work, and make provisions for thermal expansion. Submit details of expansion joints for approval. Install fasteners through one edge of metal only, use a hook strip on the other edge.

C. Use stainless steel pin Zamac type nail-in fasteners, or stainless steel screws and washers with neoprene inserts where fasteners will be exposed.

3.4 CAP FLASHINGS

A. Install new copper cap flashings built into masonry walls properly joined to all related materials in a watertight manner.
   1. Solder all joints in the new cap flashing, except form 2 inch wide flat locked sealant filled expansion joints a maximum of 32 feet on center.
   2. Secure the joints with rivets spaced 1 inch on center positioned about 1/2 inch from the top edge of the joint, then sweat solder the joint.
   3. Form the flashing to turn up 2 inches inside the wall and finish with a hem on the bottom exposed edge.
   4. Fasten the top edge of the cap flashing to the backup masonry 12 inches on center.
   5. Install the new cap flashing under flexible type wall flashings where possible. Where it is not possible to lap the new cap flashing under an existing wall flashing, install a ply of glass cloth set in and coated with asphalt cement to connect the new cap flashing to the existing wall flashing.
   6. In the absence of an existing wall flashing, or at a solid masonry wall, turn up the new cap flashing 2 inches behind the first wythe of masonry.

7. Install new cap flashings where shown on the drawings, and at a height of 10 to 12 inches above the roof surface.
8. Install new cap flashings above parapet flashings and above eave metal at transitions with higher walls.

B. Install new aluminum cap flashings on the equipment curbs.
1. Form the cap flashing to extend at least 2 inches under the equipment or skylight, 4 inches over the base flashing, and finish with a 1/2 inch hem on the bottom edge.
2. Install a 1/2 inch thick by 2 inch wide continuous foam gasket between the cap flashing and mechanical equipment or skylight. Do not set the equipment or skylight in sealant.
3. Secure the equipment with stainless steel screws spaced 12 inches on center.

3.5 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Conduct an inspection of the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.

B. The Owner's Representative will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leakage or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. Clean up all litter, refuse, rubbish, scrap materials and debris at least twice a day; at noon and at the end of the work day, so the roof and site presents a neat, orderly and workmanlike appearance. Place the debris in a dumpster, and remove the dumpster from the site as soon as it is full or no longer being used.

F. Carefully and thoroughly clean the entire roof to remove all residual debris when all work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

1.

END OF SECTION

SECTION 07 7123
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

B. Spring gutter strainer.

C. Precast concrete splash pads.

1.2 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

E. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4 DESIGN REQUIREMENTS

A. Conformto SMACNA 1793 for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Conform to applicable code for size and method of rain water discharge.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on prefabricated components.

C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

D. Samples: Submit two samples, 12 inch long illustrating component design, finish, color, and configuration.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Gutters and Downspouts:

1. Garrety Gutters, 128 West Vaughn St, Kingston, PA 18704; (800) 628-5849; garretymanufacturing@gmail.com
2. Substitutions: See Section 01 2500 Substitution Procedures.

2.2 MATERIALS

A. Pre-Finished Aluminum Sheet: 2 (1); 0.032 inch (0.8mm) thick.

B. 7 inch wide seamless aluminum gutters, fabricated from custom colored metal stock.

1. Furnish gutters with concealed aluminum fascia brackets, formed to hook onto the front edge of the gutter and get fastened through the back of the gutter with a stainless steel screw in each bracket.

2.3 COMPONENTS

A. Gutters: Box gutter with flange.

B. Gutters: .050 inch thick, 7 inch wide seamless aluminum gutters, fabricated from custom colored metal stock.
   1. Furnish gutters with concealed aluminum fascia brackets, formed to hook onto the front edge of the gutter and get fastened through the back of the gutter with a stainless steel screw in each bracket.

C. Downspouts: .032 inch thick 4 inch diameter aluminum leaders factory finished with baked acrylic enamel, in a custom color. Fasten leaders with 1/16 inch thick 1 inch wide straps spaced 7 feet on center

D. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Gutter Supports: Brackets.

2.4 ACCESSORIES

A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.
   1. Color: Regular gray

2.5 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.6 FINISHES

A. Fluoropolymer Coating: High Performance Organic Finish, 1; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.7 SPRING GUTTER STRAINER

A. 3" Spring Gutter Strainer sizes as required for downspouts.

B. Stainless Steel.

PART 3 EXECUTION

3.1 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.2 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

C. Slope gutters 1/8 inch per foot.

D. Set splash pans under downspouts.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Roof curbs.

B. Mechanical curbs.

C. Roof penetrations mounting curbs.

D. Roof mounted duct enclosure.

E. Drains, drain pipes and couplings.

F. Pipe insulation and fitting covers.

G. Molded pipe flashing.

H. Gas line and equipment supports.

I. Pipe curbs and portals.

J. Duct and pipe supports.

K. Roof walkway pads.

1.3 RELATED REQUIREMENTS

A. Section 04 0100 - Maintenance of Masonry.

B. Section 05 5000 - Metal Fabrications for roof equipment supports.

C. Section 06 1010 - Roof Related Rough Carpentry

D. Section 07 6200 - Sheet Metal Flashings and Specialties.

E. Plumbing Divisions 22 for roof drains.

F. Mechanical Division 23 for equipment.

G. Electrical Division Electrical

1.4 CODE REQUIREMENTS

A. Refer to 01 4100 - Regulatory Requirements.

1.5 REFERENCE STANDARDS

A. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. A pre-work site and building inspection report with photos to document conditions before work starts.

C. Submit the following items in advance to obtain approval prior to performing any work.

D. Submittals shall be prepared and made by the firm that will perform the actual work

E. Provide electronic submittals via an on-line submittal exchange program if one is established for this project.

F. If on-line program isn't established, provide the submittals on portable USB drives in PDF format, organized in folders by Section.

G. Product Data: Manufacturer's on each product to be used all technical data sheets required for this project .Incomplete submittals will not be reviewed.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

H. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
   1. Coordinate with other prime contractor (s) for roof accessories provided by them and installed by the General Contractor.

I. Samples: Submit samples when requested.

J. Safety Data Sheets: Provide all Safety Data Sheets where indicated in individual specification sections. Provide 1 per building.

K. Samples of the Contractor's and Manufacturer's guarantee/warranty forms.

L. Warranty Documentation:
   1. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.
   2. Submit certification from roofing manufacture that existing warranty remains in effect,

1.7 QUALITY ASSURANCE

A. Standards: Comply with SMACNA "Architectural Sheet Metal Manual" fabrication details and "NRCA Roofing and Waterproofing Manual" installation details unless otherwise indicated.

B. Manufacturer Qualifications: Provide each primary product, produced by a single Manufacturer, which has produced that type product successfully for not less than five (5) years which has manufactured the same product in the United States of America for not less than 5 continuous years.

C. Installer Qualifications: A firm with not less than five (5) years of successful experience installing specialties similar to those required for this project employing personnel skilled in the work specified.
   1. The Installer shall provide a reference list of at least three completed projects of comparable size and similar design, within a fifty mile radius of this project.
   2. Provide name address, telephone number of Owner, Architect, and Construction Manager

D. Installer's Field Supervision: Maintain full time supervisor/foreman on jobsite during times that installation work is in progress. Supervisor must have minimum of 5 years experience in work similar in nature and scope.
   1. Submit the supervisor's resume upon request.

E. Installer must attend the Pre-Roofing Conference and discuss how the installation of specialties will be coordinated with the installation of roofing, insulation, metal and membrane flashings and all other similar items to provide a watertight installation; to review the schedule for installation of the specialties as they relate to roofing work; and to verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays. Including:
   1. The condition of the substrate, curbs, penetrations and other preparatory work needed.
   2. The construction schedule, forecast weather, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
   3. A schedule for Manufacturer and Architect inspections.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver material to the site in the Manufacturer's original and unopened packaging, with intact and legible labels which identify the products and Manufacturers

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store products under cover and elevated above grade.

D. Do not overload the structure when storing materials on the roof.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year Contractor's warranty for that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Substaintial Completion..

1. Defective work includes but is not limited to the following types of failure: leakage, delamination, lifting, loosening, splitting, cracking, undue expansion, peeling paint.
2. Guarantee coverage shall have no dollar limit.
3. Contractor’s Guarantee covers “all work performed” when a single contractor/installer is awarded work specified in multiple Sections.

C. Provide a Manufacturer's written warranty, which warrants the skylights will remain watertight for a minimum five year term beginning upon final completion.

D. The Contractor’s Surety Company may add a rider to the Performance Bond which clarifies that Performance Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor’s Guarantee

E. The Guarantee shall be issued no more than 30 days after approval of the punch list work.

F. The Guarantee shall include the removal and replacement of items or materials installed with the roof specialties as part of the original work, if removal is needed to effect guaranteed repairs.

PART 2 PRODUCTS

2.1 FACTORY FABRICATED PIPE CURB PORTALS

A. Provided by HVAC Contractor and installed by the General Contractor. Refer to HVAC drawings.

2.2 DRAINS, DRAIN PIPES AND COUPLINGS

A. Conventional cast iron roof drains, installed with drain receivers, under deck clamps where possible, cast iron strainers, cast iron clamping rings and factory installed stainless steel gravel screens Series 1011 and 1025 as manufactured by Jay R. Smith Manufacturing Company.

B. Match the drain outlet size and style to the building drain lines, except if the drain line is a copper pipe, then furnish the drain body with a threaded outlet and use a male adapter to connect the drain body To the drain line.

C. Drain pipe: cast iron pipe with no hub fittings, minimum 3inch diameter, and larger to match the existing building drain lines.

D. No-hub couplings: heavy duty rubber neoprene sleeve couplings with full length Type 304 stainless steel shields and at least 4 worm drive clamps, conforming to ASTM A564.

2.3 ROOF WALKWAY PADS AND CONCRETE PAVERS

A. 2 inches thick, 24 inches by 24 inches precast concrete pavers, natural buff color and finish, minimum 7500 psi compressive strength as manufactured by Hanover Architectural Products, Co., Inc. or approved equal.

1. Provide under all pedestal pipe supports as indicated on drawings.

B. 30 inches by 30 inches hard rubber walkway pads, color; black, as manufactured by Firestone or equal.

1. Install walkway pads to provide a path 2 - 1/2 feet wide were show, and at all roof access points; ie. doors, ladders, hatches under concrete pavers used for conduit and pipe supports and around all HVAC equipment.

2. Provide under all concrete pads and where shown ode drawings. Adhere each pad with five self adhesive strips - do not install the pads using three strips of tape as supplied by the manufacturer.

2.4 PIPE INSULATION AND FITTING COVERS

A. Insulation: minimum 1 inch thick pre-molded 3.5 lb. heavy desnity fiberglass pipe insulation with UL rated non-combustible service jackets.

B. .030 inch thick factory fabricated white PVC "Smoke Safe" fitting and drain bowl covers as manufactured by the Speedline Corporation, with a maximum Flame Spread Value of 252 and a maximum Smoke Developed Value of 50 in accordance with ASTM E8450.

2.5 MOLDED PIPE FLASHING

A. Black molded EPDM with stainless steel warm gear type clampas manufactured by Elevate (Firestone) model #W563581063.

B. .030 inch thick factory fabricated white PVC "Smoke Safe" fitting and drain bowl covers as manufactured by the Speedline Corporation, with a maximum Flame Spread Value of 25 and a maximum Smoke Developed Value of 50 in accordance with ASTM E8450.

2.6 GAS LINE AND EQUIPMENT PIPE SUPPORTS

A. Pipe support to be installed by the Plumbing Contractor.

B. Install concrete paver and walkway pad under pipe supports minimum five feet on center.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Fuller and D'Angelo, P.C. of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.4 FACTORY FABRICATED PIPE CURB PORTALS

A. Install factory fabricated pipe portal flashing system where indicated on drawings and where more than one pipe or conduit penetrates the roof.

1. Install the portal curbs on wood blocking that matches the thickness of the roof insulation.
    a. Coordinate and install the curbs and housing books before the mechanical and electrical contractors run their lines and pipes; so the llines and pipes get properly installed through the curbas and boots.

3.5 DRAINS, DRAIN PIPES AND COUPLINGS:

A. Remove and replace the existing drains where roof removal and replacement work is indicated.

1. Remove the existing drains and flashings; use care not to break or disturb the drain pipes within the building.
2. Modify the existing drain lines to properly connect to the new drain assemblies.
3. Enlarge the hole in the deck and reinforce the deck to accommodate the new drain, and install the drain recessed below the roof surface to achieve maximum drainage.
4. Support the drain with a stamped sump drain receiver, secure it with an under deck clamp and patch the deck around the new drain.

5. Connect the new drain to the existing drain line to conform to all applicable codes, and insulate the underside of the drain body and drain line.

B. Note where existing drains are being relocated and where additional drains are being installed. Reinforce the underside of the deck at new drain locations. After installing the drains as described above, install new drain pipe to connect each new drain to the existing storm sewer system.

C. Install new drain pipes to slope 1/4 inch per foot, and support each section of pipe with a hanger, supported on a structural member or strut, on each side of every coupling. Do not hang the drain pipes from the roof deck.

3.6 MOLDED PIPE FLASHING

A. Clean roofing membrane.

B. Cut top edge of ring corresponding to pipe size.

C. Install per specific requirements of the manufacturers instructions.

3.7 PIPE INSULATION AND FITTING COVERS:

A. Install insulation on all horizontal drain piping, and on new vertical pipes installed to connect the new drains to the existing lines.

B. Install insulation on the undersides of the new drains.

C. Install white PVC fitting and drain bowl covers, and wrap the joints between fitting covers and pipe insulation jackets with 3 inch wide white PVC tape.

3.8 MISCELLANEOUS

A. Provide and install any sealants needed, where shown or required.

B. Provide new material, couplings, transition pieces, blocking, fasteners and the similar accessories needed to complete the work.

C. Owner's Representative and Contractor shall inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any other work at the site.

D. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

E. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather - which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

3.9 CLEANING

A. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather - which may occur unexpectedly. Make all work areas watertight at the end of each day's work

B. Carefully and thoroughly clean the entire roof to remove all residual debris when all work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system

3.10 PROTECTION

A. Protect existing and new roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

B. Protect installed products until completion of project.

C. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

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 SECTION INCLUDES

A. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.4 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015.

D. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013 (Reapproved 2017).

E. ITS (DIR) - Directory of Listed Products; current edition.

F. FM 4991 - Approval Standard for Firestop Contractors; 2013.

G. FM (AG) - FM Approval Guide; current edition.

H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

J. UL (FRD) - Fire Resistance Directory; Current Edition.

K. UL 2079 - Standard Test Method of Fire Resistant Joints

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

1.6 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD) or FM (AG) will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:

PART 2 PRODUCTS

2.1 MATERIALS

A. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.2 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.

B. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.3 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, AND WALL-TO-WALL JOINTS

A. Gypsum Board Walls:
   1. Wall-to-Wall Joints That Have Movement Capabilities (Dynamic-D):
      a. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
   2. Head-of-Wall Joints at Concrete Over Metal Deck:
      a. 2 Hour Construction: UL System HW-D-0034; Specified Technologies Inc. ES Elastomeric Firestop Sealant.
      b. 2 Hour Construction: UL System HW-D-0043; Specified Technologies Inc. AS200 Elastomeric Spray.
   3. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs:
      a. 1 Hour Construction: UL System HW-D-0049; Hilti CFS-SP WB Firestop Joint Spray and CP 672.

2.4 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Penetrations Through Floors or Walls By:
   1. Multiple Penetrations in Large Openings:
      a. 1 & 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 1 & 2 Hour Construction: UL System C-AJ-1226; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   3. Electrical Cables Not In Conduit:
      a. 1 & 2 Hour Construction: UL System W-J-3199; Hilti CFS-SL SK Firestop Sleeve Kit.
   4. Insulated Pipes:
      a. 1 & 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE IMAX intumescent Firestop Sealant.
   5. HVAC Ducts, Uninsulated:
      a. 1 & 2 Hour Construction: UL System C-AJ-7111; Hilti FS-ONE MAX Intumescent Firestop Sealant.

B. Penetrations Through Floors By:
   1. Multiple Penetrations in Large Openings:
      a. 1 & 2 Hour Construction: UL System F-A-8012; Hilti CFS-S SIL GG Firestop Silicone Sealant Gun-Grade or CFS-S SIL SL Firestop Silicone Sealant Self-Leveling.

2. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 1 & 2 Hour Construction: UL System F-A-1016; Hilti CP 680-P/M Cast-In Device.
3. Insulated Pipes:
   a. 2 Hour Construction: UL System F-A-5015; Hilti CP 680-P/M Cast-In Device.

C. Penetrations Through Walls By:
1. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 1 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
2. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System C-AJ-3095; Hilti FS-ONE MAX Intumescent Firestop Sealant.
3. Insulated Pipes:
   a. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 1 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
4. HVAC Ducts, Uninsulated:
   a. 1 & 2 Hour Construction: UL System W-J-7109; Hilti FS-ONE MAX Intumescent Firestop Sealant or CP 606 Flexible Firestop Sealant.
5. HVAC Ducts, Insulated:
   a. 1 & 2 Hour Construction: UL System W-J-7112; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.5 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Blank Openings:

B. Penetrations By:
1. Multiple Penetrations in Large Openings:
   a. 1 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
2. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 1 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.
3. Electrical Cables Not In Conduit:
   a. 1 Hour Construction: UL System W-L-3393; Hilti CFS-SL RK Retrofit Sleeve Kit for Existing Cables.
4. Insulated Pipes:
   a. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
5. HVAC Ducts, Insulated:
   a. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.6 MATERIALS

A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
1. Manufacturers:

a. 3M Fire Protection Products; Product CP-25WB: www.3m.com/firestop.
b. Substitutions: See Section 01 2500 Substitution Procedures.

C. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening; conforming to the following:
1. Density: 4 lb/cu ft.
2. Manufacturers:
a. Thermafiber, Inc: www.thermafiber.com.
3. Substitutions: See Section 01 2500 Substitution Procedures.
4. Substitutions: See Section 01 2500 Substitution Procedures.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.3 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.4 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Acoustical sealant.

D. Joint backings and accessories.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 07 2500 - Weather Barriers: Sealants required in conjunction with water-resistive barriers.

C. Section 07 8400 - Firestopping: Firestopping sealants.

D. Section 08 7100 - Door Hardware: Setting exterior door thresholds in sealant.

E. Section 08 8000 - Glazing: Glazing sealants and accessories.

F. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

G. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.4 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012 (Reapproved 2017).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

E. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2013.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required.
6. Sample product warranty.
7. Certification by manufacturer indicating that product complies with specification requirements.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

F. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

G. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

H. Executed warranty.

1.6 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 the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.

1. Identification of testing agency.
2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
    a. Test date.
    b. Copy of test method documents.
    c. Age of sealant upon date of testing.
    d. Test results, modeled after the sample form in the test method document.
    e. Indicate use of photographic record of test.

E. Field Quality Control Plan:

1. Visual inspection of entire length of sealant joints.

F. Field Adhesion Test Procedures:

1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Edgemont School District.
6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Fuller and D'Angelo, P.C. .

G. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.

1. Sample: At least 18 inches long.
2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Edgemont School District's name and register with manufacturer.

1.8 MOCK-UP

A. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution:
   1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Bostik Inc: www.bostik-us.com.
   2. Dow Corning Corporation: www.dowcorning.com/construction.
   3. Pecora Corporation: www.pecora.com.
   4. Sika Corporation: www.usa-sika.com.
   5. W.R. Meadows, Inc: www.wrmeadows.com/sle.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
   1. Pecora Corporation: www.pecora.com.
   2. Sika Corporation: www.usa-sika.com.
   3. W.R. Meadows, Inc: www.wrmeadows.com.

2.2 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
   1. Type ___ - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.

C. Interior Vertical Joints: Use non-sag polyurethane sealant, unless otherwise indicated.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.3 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 01 6116.

2.4 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus ____ percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
   5. Color: To be selected by Fuller and D'Angelo, P.C. from manufacturer's standard range.
   6. Cure Type: _____.
   7. Service Temperature Range: Minus 20 to 180 degrees F.
   8. Manufacturers:
      a. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): www.pecora.com.
      b. Sika Corporation; Sikasil 728NS: www.usa-sika.com.

B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Fuller and D'Angelo, P.C. from manufacturer's standard range.
   4. Cure Type: Single-component, neutral moisture curing
   5. Service Temperature Range: Minus 65 to 180 degrees F.
   6. Manufacturers:
      a. Pecora Corporation; Pecora 860: www.pecora.com.
      b. Sika Corporation; Sikasil 728NS: www.usa-sika.com.
      c. Substitutions: 01 2500 - Substitution Procedures.

C. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Applications: Use for:
      a. All perimeter joints of toilet fixtures, cabinets, casework, countertops and similar locations.
   3. Manufacturers:
      a. 786 Mildew Resistant; Dow Corning.
      b. Pecora Corporation; Pecora 898 NST (Non-Staining Technology):: www.pecora.com.
      c. Sika Corporation; Sikasil GP: www.usa-sika.com.
      d. Sanitary 1700; GE Silicones..

D. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Color: To be selected by Fuller and D'Angelo, P.C. from manufacturer's standard range.
   3. Service Temperature Range: Minus 40 to 180 degrees F.
   4. Manufacturers:
      a. Pecora Corporation; Dynatrol II;: www.pecora.com.
      b. Sika Corporation; Sikaflex-1a: www.usa-sika.com.
   5. Applications: Use for:

a. All exterior and interior vertical joints.

6. Substitutions: 01 2500 - Substitution Procedures.

E. Type Acoustical Sealant: - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-hardening, non-sagging; not intended for exterior use.

1. Color: To be selected by Fuller and D'Angelo, P.C. from manufacturer's standard range.
2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
3. Manufacturers:
   a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant: www.pecora.com.
4. Applications: Use for:
   a. Use for all interior joints of where acoustical sealant indicated.
5. Substitutions: 01 2500 - Substitution Procedures

2.5 SELF-LEVELING SEALANTS

A. Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.

1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
2. Hardness Range: 0 to 15, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Fuller and D'Angelo, P.C. from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Manufacturers:
   a. Pecora Corporation; Pecora 300 SL (Self-Leveling): www.pecora.com.
   b. Sika Corporation; Sikaflex 1c SL: www.usa-sika.com.
   c. Use for all horizontal exterior joints and interior joints in wet areas..

B. Self-Leveling Polyurethane Sealant for Horizontal Expansion Joints: ASTM C920, Grade P, Uses T, M, and O; multi-component; explicitly approved by manufacturer for horizontal expansion joints.

1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 30 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Fuller and D'Angelo, P.C. from manufacturer's standard range.
4. Tensile Strength: 200 to 250 psi in accordance with ASTM D412.
5. Manufacturers:
   a. Pecora Corporation; DynaTrol II-SG (Slope Grade): www.pecora.com.

2.6 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
3. Open Cell: 40 to 50 percent larger in diameter than joint width. (Not to be used in flat or horizontal joints)
4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width. (Use for flat and horizontal joints)

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.

1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
2. Notify Fuller and D'Angelo, P.C. of date and time that tests will be performed, at least seven days in advance.
3. Record each test on Preinstallation Adhesion Test Log as indicated.
4. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Fuller and D'Angelo, P.C. .
5. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.2 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.3 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Self-leveling joints: Recess joint depth as recommended by the sealant manufacturer.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Fire-rated hollow metal doors and frames.

B. Patching existing metal frames.

C. Verification of existing rated doors and or frames.

D. Foam door seal.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry.

B. Section 08 1613 - Fiberglass Doors And Aluminum Frames

C. Section 08 7100 - Door Hardware.

D. Section 09 2116 - Gypsum Board Assemblies.

E. Section 09 9123 - Interior Painting: Field painting.

1.4 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. HMMA: Hollow Metal Manufacturers Association.

C. NFPA: National Fire Protection Association.

D. SDI: Steel Door Institute.

E. UL: Underwriters Laboratories.

1.5 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

H. ASTM C476 - Standard Specification for Grout for Masonry; 2018.

I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

K. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

O. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

S. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

T. UL (BMD) - Building Materials Directory; current edition.

U. UL (DIR) - Online Certifications Directory; Current Edition.

V. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

W. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Details of each opening, showing elevations and frame profiles

D. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five (5) years experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of experience.

C. Maintain at project site copies of reference standards relating to installation of products specified.

D. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Steelcraft, an Allegion brand 1819 N. Pennsylvania St. Carmel, IN 46032; Toll Free Tel: 877-578-1247; Product L-Series: Full flush design door: www.allegion.com/us.

2. Substitutions: See Section 01 2500 Substitution Procedures.

2.2 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Beveled.
   5. Typical Door Face Sheets: Flush.
   6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
      a. Provide 14 gauge channel reinforcing for all door closers.
   7. Galvanizing including all doors and frames: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.

2.3 EMBOSSED WOOD GRAIN FINISH DOORS

A. Full Flush Doors:

B. Acceptable Product: Steelcraft Tech "L" Series.
   1. Performance:
      a. Physical performance: 5 million cycles per ANSI A250.4.
      b. Sound attenuation (gasketed):
         a) Honeycomb core, 35 STC.
      c. Thermal performance (gasketed), ASTM C1363.
         a) Polystyrene core, 0.48 U-factor.
      d. Thermal performance (gasketed), ASTM C236.
         a) Honeycomb core, 0.363 U-factor.

C. Door Thickness: 1-3/4 inches.

D. Gauge: 16 Gauge.

E. Door faces reinforced and sound deadened as follows:
   1. Honeycombe Core:
      a. Sanded for maximum adhesion.
      b. Impregnated with phenolic resin.
      c. Laminated to bothface sheetswith contact adhesive.

F. Vertical edge seams: Provide doors with continuous vertical mechanical inter-locking joints at lock and hinge edges. Finish edges as follows:
   1. Full Height, Epoxy Filled Mechanical Interlock Edges provide structural support and stability the full height of the door edges.
      a. Filled Edge Seam: Seam filled with structural adhesive and dressed smooth.

G. Bevel hinge and lock door edges 1/8 inch (3 mm) in 2 inches (50 mm). Square edges on hinge and/or lock stiles are not acceptable.

H. Reinforce top and bottom of doors with galvannealed 14 gage (1.7 mm), welded to both panels.

I. Glazing Bead: Formed steel sheet or snap-in Designer trim.

J. Fire Rating: Supply door units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.

K. In addition to the requirements listed in Par 2.3 the following apply where wood grain finished are indicated:
   1. Fabricated from steel that has an embossed wood grain pattern extending the full height and width of the door. Provide a wood grain embodiment minimum .005" deep. Applied grain pattern or material is not acceptable.

L. Anchors: Manufacturer's standard framing anchors, specified in manufacturer's printed installation instructions for project conditions.

M. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings.

N. Door Bottom:
   1. Acceptable Product: Steelcraft Fas-Seal Door Bottom.
   2. Characteristics: Electrometric, continuous strip, screw-attached to recessed bottom door channel for concealed installation; double-sealing; acceptable for fire-rated doors up to 3 hour rating.

O. Plaster Guards: Same material as door frame, minimum 24 gage (0.5 mm) minimum; provide for all strike boxes.

P. Silencers: Resilient rubber, Inserted type, three per strike jamb for single openings and two per head for paired openings. Stick-on silencers shall not be permitted except on hollow metal framing systems.
   1. Provide silencers on all existing frames.

Q. Finish: Complete factory finish.

2.4 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Interior Door Frames: Full profile/continuously welded type..
   1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
   2. Frame Finish: Factory primed and field finished.

2.5 FINISHES

A. Refer to Section 09 9213 Interior Painting.

B. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.6 ACCESSORIES

A. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

B. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

C. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

D. Frame Anchors: Minimum of six wall anchors and two base anchors.
   1. T anchors for masonry.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated and NAAMM HMMA 840.

B. Install prefinished frames after painting and wall finishes are complete.

C. Install fire rated units in accordance with NFPA 80.

D. Coordinate frame anchor placement with wall construction.

E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

F. Install door hardware as specified in Section 08 7100.
   1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

G. Comply with glazing installation requirements of Section 08 8000.

H. Coordinate installation of electrical connections to electrical hardware items.

I. Install perimeter foam seal in accordance with requirements specified in Section 07 9005.
   1. Fill all exterior spaces and joint between windows and doors solid with foam in accordance with manufacture's instructions.
   2. Cut back to permit application of joint sealant.

J. Touch up damaged factory finishes.

3.4 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.6 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1613
FIBERGLASS DOORS AND ALUMINUM FRAMES

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 SECTION INCLUDES

A. Fiberglass doors installed in thermal break aluminum framing.

B. Fiberglass doors SL-17 and SL-18 FRP/Aluminum Hybrid Door installed in Thermally Broken Aluminum Framing.

C. Door hardware.

D. Glazing.

E. Snap trim.

F. Factory installed Finish Hardware

G. Foam door seal.

H. Accessories.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements

B. Section 01 7800 - Closeout Submittals

C. Section 04 2000 - Unit Masonry

D. Section 05 5000 - Metal Fabrications for steel lintels.

E. Section 08 1213 - Hollow Metal Frames.

F. Section 08 7100 - Door Hardware.

1.4 REFERENCE STANDARDS

A. AAMA 1304 - Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems; 2018.

B. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

D. ASTM-B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

E. ASTM-B117 – Standard Practices for Operating Salt Spray (Fog) Apparatus.

F. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

G. ASTM-C518 – Standard test Method for Steady-State Thermal Transmission Properties by Means of Heat

H. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

I. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).

J. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.

K. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2016.

L. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics

M. ASTM-D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.

N. ASTM D 1623 - Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics

O. ASTM D 2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging

P. ASTM D 2583 - Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

Q. ASTM-D3029 – Test Methods for Impact Resistance of Flat Rigid Plastic Specimens by Means of a Tup (Falling Weight) (Withdrawn 1995) (Replaced by ASTM-D5420).

R. ASTM-D5116 – Standard Guide for Small-Scale Environmental Chamber Determinations of Organic

S. ASTM D 5420 – Impact Resistance of Flat Rigid Plastic Specimens by Means of a Falling Weight.

T. ASTM D 6670 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products

U. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

V. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

W. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

X. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

Y. ASTM-E1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

Z. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2017.

AA. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).

AB. ASTM F 476 - Security of Swinging Door Assemblies.

AC. ASTM-F1642-04 – Standard Test Method for Glazing Systems Subject to Air Blast Loading.

AD. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

AE. NWWDA T.M. 7-90 - Cycle Slam Test Method

AF. NFRC 100 – Procedure for Determining Fenestration Products U-Factors.

AG. NFRC 400 – Procedure for Determining Fenestration Products Air Leakage.

AH. TAS 201 – Impact Test Procedures.

AI. TAS 202 – Criteria for Testing Impact & Non-impact Resistant Building Envelope Components Using Uniform Static Air Pressure.

AJ. TAS 203 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.

C. Test Reports: Show compliance with specified criteria.

D. Shop Drawings: Indicate layout and profiles; include assembly methods.

1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.

2. Indicate wall conditions, door and frame elevations, sections, materials, gauges, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on drawings to identify details and openings.

E. Selection Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.

F. Door Corner Sample: When requested submit corner cross sections, 10 inches by 10 inches in size, illustrating construction, finish, color, and texture.

G. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

J. Maintenance Data: Include instructions for repair of minor scratches and damage.

K. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Edgemont School District's name and registered with manufacturer; include detailed terms of warranty.

L. Closeout Submittals.

1. Operation and Maintenance Manual.
   a. Submit manufacturer’s maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.
2. Warranty Documentation.
   a. Submit manufacturer’s warranty.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than ten years of documented experience.

1. Door and frame components from same manufacturer.
2. Evidence of a compliant documented quality management system.
3. The manufacturer shall provide a factory trained technician to visit this project and instruct the installers in the proper installation of the door and frame assemblies.

B. Standards: Comply with the requirements and recommendations in applicable specifications and standards by NAAMM, AAMA, and AA, including the terminology definitions, and specifically including the "Entrance Manual" by NAAMM, except to the extent more stringent requirements are indicated.

C. All materials, equipment and operation supplied shall conform to all Code requirements including Accessibility for the Handicapped.

D. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience and approved by manufacturer.

E. **FIELD MEASUREMENT**

1. Verify field measurements prior to fabrication of doors and frames to insure proper fitting of assemblies. Successful bidders are expected to field verify all dimensions, sizes, quantities and the material required to complete this project. Failure to do so will not relieve the successful contractor from the necessity of furnishing any and all materials that my be required, without any additional costs to the Owner.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Mark doors with location of installation, door type, color, and weight.

B. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact. Materials shall be inspected for damage, and the manufacturer shall be advised immediately of any discrepancies. Unsatisfactory materials are not to be used.

C. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.

1. Doors shall be "floated" within cartons, with no portion of the door having contact with the outer shell of the container.
2. Store at temperature and humidity conditions recommended by manufacturer.
3. Do not use non-vented plastic or canvas shelters.
4. Immediately remove wet wrappers.
5. Store in position recommended by manufacturer, elevated minimum 4 inches above grade, with minimum 1/4 inch space between doors.

1.9 FIELD CONDITIONS

A. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Special Project Warranty:
1. Provide a written warranty signed by Manufacturer, Installer and Contractor, agreeing to replace, at no cost to the Owner, any doors or frames that fail in materials or workmanship, within the time period of acceptance, as indicated below. Failure of materials or workmanship includes excessive deflection, faulty operation of entrances, deterioration of finish, or construction, in excess of normal weathering, and defects in hardware, weather stripping, and other components of the work. In addition the manufacturer further certifies that they have factory installed all hardware and such hardware is also guaranteed not to come loose during the guarantee period.
2. Warranty Time Period: Ten (10) Years from substantial completion.
3. Limited lifetime
   a. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.
   b. Failure due to corrosion on FRP components.
4. Finish
   a. Kynar painted aluminum: 10 years.
   b. Painted SL-17 and FRP face sheets: 5 years.
   c. Painted AF-150 frames, AF-250 frames: 3 years.
   d. Anodized, aluminum:10 years.
5. All warranties shall commence at Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fiberglass Reinforced Plastic Doors:
1. Special-Lite, Inc; PO Box 6, Decatur, Michigan 49045. Toll Free (800) 821-6531. Phone (269) 423-7068. Fax (800) 423-7610. Web Site www.special-lite.com. E-Mail info@special-lite.com.: www.special-lite.com.
2. Subject to compliance with requirements, other manufacturers are acceptable:
   a. Tubelite - Reed City, Michigan
   b. Vista-Wall/Old Castle, Lincoln, R.I.
3. Substitutions: Not permitted.

2.2 DOOR AND FRAME ASSEMBLIES

A. Model.
1. SL-17 Pebble grain Finish door installed in Thermally Broken Aluminum Framing.
2. SL-18 Fiberglass wood grain.

B. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.

1. Screw-Holding Capacity: Tested to 890 pounds, minimum.
2. Surface Burning Characteristics: Flame spread index (FSI) of 0 to 25, Class A, and smoke developed index (SDI) of 450 or less, when tested in accordance with ASTM E84.
3. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
4. Door Opening Size: Sizes: Refer to Door Schedule. indicated on drawings.
5. Clearance Between Door and Frame: 1/8 inch, maximum.
6. Clearance Between Meeting Stiles of Pairs of Doors: 1/8 inch, maximum.
7. Clearance Between Bottom of Door and Finished Floor: 3/4 inch, maximum; not less than 1/4 inch clearance to threshold.

2.3 COMPONENTS

A. Doors: Fiberglass construction with reinforced core.
   1. Type: As indicated on drawings, including swinging and sliding doors.
   2. Thickness: 1-3/4 inch, nominal.
      a. Core: Expanded polystyrene foam (EPS).
      b. Laid in foam cores are not acceptable.
      c. Foam Plastic Insulation Doors: IBC 2603.4.
      d. Foam plastic shall be separated from the interior of a building by an approved thermal barrier.
      e. Approved thermal barrier must meet the acceptance criteria of the Temperature Transmission Fire Test and Integrity Fire Test as stated in NFPA 275.
      f. Per 2020 BCNYS 2603.4.1.7 for non-rated swing doors with plastic foam cores- provide a thermal barrier of not less than 0.032" thick aluminum or steel with basic thickness of not less than 0.016" between the foam core and FRP skin, unless the standard construction of the door assembly passes an independent test in conformance with 2603.9.'
      g. Standard door assembly can be tested to show it meets these requirements without the use of thermal barrier. Testing shall be in compliance with IBC/NYSBC 2603.9. If no independent testing conducted all doors with foam plastic core must have a thermal barrier.
   3. Face Sheet.
      a. Exterior
         a) 0.120" thick, through color with SpecLite 3® integral surfaseal film FRP sheet.
         b) Class C.
      b. Interior
         a) 0.120" thick, through color with SpecLite 3® integral surfaseal film FRP sheet.
         b) Class A.
      c. Attachment of face sheet.
         a) Extruded stiles and rails to have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
         b) Use of glue to bond face sheet to core or extrusions is not acceptable
   4. Door Panel Configuration: As indicated on drawings.
   5. Reinforcements: .
      a. Aluminum extrusions made from 6061 or 6063 aluminum alloys
      b. Sheet and plate to conform to ASTM-B209.
      c. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
      d. Bars and tubes to meet ASTM-B221.
   6. Cutouts.
      a. Manufacture doors with cutouts for required vision lites, louvers, and panels.
   7. Fasteners.

a. All exposed fasteners will have a finish to match material being fastened.
b. 410 stainless steel or other non-corrosive metal.
c. Must be compatible with items being fastened.

8. Sustainability Characteristics.
9. Hardware Preparations: Factory reinforce, machine, and prepare for door hardware including field installed items; provide solid blocking for each item; field cutting, drilling or tapping is not permitted; obtain manufacturer's hardware templates for preparation as necessary.
   a. Pre-machine doors in accordance with templates from specified hardware manufacturers.
   b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
   c. Factory install door hardware.
10. Finish:
    a. SL-18 - Painted.

2.4 FRAMING

A. Thermally Broken Aluminum Framing Model: SL-600TB.
   1. Aluminum Members.
      a. Manufacturer: Special-Lite Inc.
      b. Model SL-450 TB (2" x 4 1/2")
      c. Model SL-600 TB (2" x 6")
      d. Aluminum extrusions made from 6061 or 6063 aluminum alloys.
   2. Perimeter Frame Members.
      a. Storefront frame with thermally broken pocket filler.
      b. Factory fabricated.
      c. Open-back framing is not acceptable
   3. Thermal Strut.
      a. Fiber reinforced plastic, no other materials will be accepted.
   4. Applied Door Stops.
   5. 5/8” x 1-1/4” or 5/8” x 1-3/4”, 0.125” wall thickness, with screws and weather-stripping.
   6. Provide solid ½” aluminum bar behind door stop for closer shoe attachment.
   7. Pressure gasketing for weathering seal.
   8. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
   9. Minimum ½” aluminum bar reinforcement under doorstop for required hardware attachments, aluminum to meet ASTM-B221
   10. Caulking.
       a. Caulk joints before assembling frame members.
   11. Frame Member to Member Connections.
       a. Secure joints with fasteners.
       b. Provide hairline butt joint appearance.
       c. Shear block construction only, no screw spline allowed.
   12. Hardware
       a. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
       b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
       c. Factory install door hardware
   13. Anchors:
       a. Anchors appropriate for wall conditions to anchor framing to wall materials.
       b. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
       c. Secure head and sill members of transom, side lites, and similar conditions.

B. Door and Borrowed Lite Frames: Provide type in compliance with performance requirements specified for doors.
   1. Profiles: As indicated on drawings.
   2. Door Stop: 5/8 inch wide, by 1-7/8 inches deep.
   3. Non-Fire-Rated:
      a. Aluminum, 0.04 inch minimum wall thickness; natural anodized finish.
   4. Hardware Cut-outs: Provide continuous backing or mortar guards of same material as frame, with watertight seal.
   5. Frame Anchors: Stainless steel, Type 304; provide three anchors in each jamb for heights up to 84 inches with one additional anchor for each additional 24 inches in height.

2.5 PERFORMANCE REQUIREMENTS

A. Face Sheet.
   1. Standard Interior and Exterior Class C 0.120" thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
      a. Flexural Strength, ASTM-D790: 21 x 103 psi.
      b. Flexural Modulus, ASTM-D790: 0.7 x 106 psi.
      c. Tensile Strength, ASTM-D638: 13 x 103 psi.
      d. Tensile Modulus, ASTM-D638: 1.2 x 106 psi.
      e. Barcol Hardness, ASTM-D2583: 55.
      f. Izod Impact, ASTM-D256: 14.0 ft-lb/in.
      g. Gardner Impact Strength, ASTM-D5420: 120 in-lb.
      h. Water Absorption, ASTM-D570: 0.20%/24hrs at 77°F.
      i. Surface Burning, ASTM-E84: Flame Spread ? 200, Smoke Developed ? 450.
      j. Taber Abrasion Resistance, Taber Test: 0.007% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.
      k. Chemical Resistance.
         a) Excellent Rating.
            (a) Acetic Acid, Concentrated.
            (b) Acetic Acid, 5%.
            (c) Bleach Solution.
            (d) Detergent Solution.
            (e) Distilled Water.
            (f) Ethyl Acetate.
            (g) Formaldehyde.
            (h) Heptane.
            (i) Hydrochloric Acid, 10%.
            (j) Hydrogen Peroxide, 3%.
            (k) Isooctane.
            (l) Lactic Acid, 10%.
      l. USDA/FSIS Requirements.
         a) FRP face sheet with SpecLite 3® integral surfaseal is a finished outer surface material that is rigid; durable; non-toxic; non-corrosive; moisture resistant; a light, solid color such as white; easily inspected; smooth or an easily cleaned texture.
         b) FRP face sheet with SpecLite 3® integral surfaseal does not contain any known carcinogen, mutagen, or teratogen classified as hazardous substances; heavy metals or toxic substances; antimicrobials; pesticides or substances with pesticidal characteristics.
   2. Door Core.
      a. Density, ASTM-D1622: S 5.0 pcf.

b. Compressive Properties, ASTM-D1621: Compressive Strength S 60 psi, Compressive Modulus ? 1948 psi.
c. Thermal Conductivity, ASTM-C518, Thermal Resistance S 0.10 m2K/W.

3. Door Panel.
   a. Thermal Transmittance, AAMA 1503-98: U-Factor = 0.29 Btu/hr/ft²/°F, CRFp = 55.
   b. Indoor Air Quality, ASTM-D5116, ASTM-D6607: GreenGuard, GreenGuard Gold.
4. Door and Thermally Broken Aluminum Frame Assembly.
   a. Thermal Transmittance, NFRC 100.
      a) Opaque Swinging Door (< than 50% glass)
         (a) U-Factor = 0.31 Btu/hr/ft² °F.
      b) Commercially Glazed Swinging Entrance Door (> than 50% glass)
         (a) U-Factor = 0.64 Btu/hr/ft²/°F.
   b. Air Leakage, NFRC 400, ASTM-E283.
      a) Opaque Swinging Door (< than 50% glass)
         (a) 0.01 cfm/sqft @ 1.57 psf.
         (b) 0.01 cfm/sqft @ 6.24 psf.
      b) Commercially Glazed Swinging Entrance Door (> than 50% glass)
         (a) 0.38 cfm/sqft @ 1.57 psf.
         (b) 0.73 cfm/sqft @ 6.24 psf.
   c. Sound Transmission, ASTM-E90: STC = 30, OITC = 29.
5. Door and Hollow Metal Steel Frame.
   a. Cycle Slam, NWWDA T.M. 7-90.
      a) 5,000,000 cycles.
         (a) No Operational Damage.
         (b) No Hinge Separation.

2.6 FINISHES

A. Doors:
   1. Aluminum
      a. Anodizing: Class 1 Color Anodizing, or Anodized Plus Color minimum 0.7 mils thick electrolytically deposited colored anodic coating with electrolytically deposited organic seal.
         a) Color: Dark Bronze, AA-M10C12C22A44.
         b) Match for all Aluminum Extrusions including the Door Edge, Lite Kit, Continuous Hinge and Framing.
   2. Paint:
      a. Fluoropolymer Two-Coat System: KYNAR
         a) Topcoat: 70% KYNAR or HYLAR® 5000 meets or exceeds all AAMA 2605 specifications, 2.5 to 4.0 wet mils,1.00 to 1.20 dry mils.
         b) Color: As selected by Architect from manufacturer's standard colors.

B. FRP Face Sheets
   1. Through color.
      a. As selected fromo manufacturer's standard colors.

C. Frame:
   1. Aluminum.
      a. Anodizing.
         a) Anodizing: Class 1 Anodizing, minimum 0.7 mils thick.
            (a) Color: As selected from manufacturer's standard colors.

2.7 Hardware

A. Door Hardware: Manufacturer's standard.
   1. Swinging Doors Hardware:
      a. Door Pushbars: SL-150.
      b. Locksets: See Section 08 7100..
      c. Closers: See Section 08 7100..
      d. Concealed adjustable bottom brush: SL-301.
      e. Thresholds: See Section 08 7100.
   2. Weatherstripping: Manufacturer's standard..

B. Astragals and Edges for Pairs of Doors: Meeting stile and door edge sealing and protection devices.
   1. Astragals: Manufacturer's standard for application.
      a. Configuration: Provide surface-mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
      b. Type: See Section 08 7100., and with cutouts for other door hardware.
   2. Door Edge Types: Beveled edge.
   3. Material: Manufacturer's standard.
   4. Metal Finish: Dark Bronze powder coating.
   5. Provide noncorroding fasteners at exterior locations.

2.8 ACCESSORIES

A. Foam window and door seal.
   1. Fill all exterior joint between windows and doors solid in accordance with manufacture's instructions.
   2. Cut back to permit application of joint sealant.
   3. Insulating-Foam Sealant: Dow Great Stuff Window & Door.

B. Stops for Glazing: Fiberglass, unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, with color and texture to match door; fasteners shall maintain waterproof integrity.
   1. Exterior Doors: Provide non-removable stops on exterior side with continuous compression gasket weatherseal.
   2. Glazed Openings: Provide removable stops on interior side.
   3. Opening Sizes and Shapes: As indicated on drawings.

C. Snap Trim as required. Match door and frame finish.

D. Door Vision Lite Frames: Frames with glazing securely fastened within door opening.
   1. Size: As indicated on drawings.
   2. Frame Material: 2 piece extroded aluminum Class 1 Anodized.
   3. Glazing: 1 inch thick, tempered insulated safety glass, in compliance with requirements of authorities having jurisdiction.

2.9 FABRICATION

A. Factory Assembly.
   1. Door and frame components from the same manufacturer.
   2. Required size for door and frame units, shall be as indicated on the drawings.
   3. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
   4. All cut edges to be free of burs.
   5. Welding of doors or frames is not acceptable.
   6. Maintain continuity of line and accurate relation of planes and angles.
   7. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.

B. Shop Fabrication

1. All shop fabrication to be completed in accordance with manufactures process work instructions.
2. Quality control to be performed before leaving each department.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.

B. Notify architect of conditions that would adversely affect installation or subsequent use

C. Do not begin installation until substrates have been properly prepared.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

B. Notify architect of conditions that would adversely affect installation or subsequent use

C. Clean and prepare substrate in accordance with manufacturer's directions.

D. Protect adjacent work and finish surfaces from damage during installation.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.

B. Install exterior doors in accordance with ASTM E2112.

C. Install door hardware as specified in Section 08 7100.

D. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

E. Anchor frames securely in place.

F. Install exterior doors to be weathertight in closed position.

G. Set thresholds in continuous bed of sealant.

H. In masonry walls, install frames prior to laying masonry; anchor frames into masonry mortar joints; fill jambs with grout as walls are laid up.

I. In stud walls, install frames prior to building walls; anchor frames to studs using concealed anchors.

J. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

K. Repair minor damages to finish in accordance with manufacturer’s instructions and as approved by Architect.

L. Repair or replace damaged installed products that cannot be successfully repaired as determined by Architect.

3.4 FIELD QUALITY CONTROL

A. Manufacturer’s representative shall provide technical assistance and guidance for installation of doors and provide written report.

3.5 ADJUSTING

A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.

B. Adjust hardware for smooth and quiet operation.

C. Adjust doors to fit snugly and close without sticking or binding.

3.6 CLEANING

A. Clean installed products in accordance with manufacturer’s instructions prior to owner’s acceptance.

B. Do not use harsh cleaning materials or methods that would damage finish.

3.7 PROTECTION

A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

B. Provide protective treatment and other precautions required through the remainder of the construction period, to ensure that the doors and frames will be without damage or deterioration (other than normal weathering) at the time of acceptance.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

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 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.3 RESPONIBILITY AND REQUIREMENTS

A. Each Contractor shall provided access doors for all dampers, valves, cleanest, junction boxes, pull boxes or similar items located above finished ceilings or ceiling breaks or extensions, behind finished walls or below finished floors. The access doors shall be steel, unless noted otherwise, hinged types as required for type of construction.
   1. Where feasible locate all dampers, valves, cleanest, junction boxes, pull boxes or similar items above acoustical panel tile ceilings.

B. Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.

1.4 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Field paint finish.

1.5 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

C. ITS (DIR) - Directory of Listed Products; current edition.

D. UL (FRD) - Fire Resistance Directory; Current Edition.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

E. Project Record Documents: Record actual locations of each access unit.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 GENERAL:

A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

B. Sizes shall be 12 X 12 inch at easily accessible valves and cleanouts; 18 X 18 inch where partial body access is required; 24 X 24 inch where entree body access is necessary.

C. Group together concealed boxes, control valves, dampers and other mechanical and electrical equipment requiring access for operation, maintenance and repair, to reduce number of access doors required.

D. Where electric motors or heaters are installed above hung ceilings, provide disconnect switch in hung ceilings within reach from access doors, unless switch is located on wall immediately below.

1. Disconnect switch shall be provided and installed by the Contractor furnishing the equipment unless shown otherwise.

E. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

F. All access doors shall have integral casing bead, white enamel prime coat, reinforced panel, flush type tamper proof lock unless noted otherwise.

G. All access doors in Toilets, Janitor Closets, Science and Prep Rooms, Storage Rooms, and Kitchen and Food Related Areas and similar spaces shall be watertight and constructed completely of stainless steel type 304.

2.2 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
1. Location: As required..
2. Panel Material: Aluminum extrusions with gypsum board inlay except in wet areas.
3. Size: As required
4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
6. Plaster Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
7. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

B. Wall-Mounted Units in Wet Areas:
1. Location: As required.
2. Material: Stainless steel, Type 304.
3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
5. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

C. Fire-Rated Wall-Mounted Units:
1. Wall Fire-Rating: Fire rating equivalent to the fire rated assembly in which they are to be installed..
   a. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.
2. Panel Material: Steel.
3. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units:
1. Location: As indicated on drawings.
2. Material: Aluminum except in wet areas.
3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

E. Manufacturers:
1. Milcor, Inc: www.milcorinc.com/#sle.
2. Substitutions: Section 01 2500 Substitution Procedures

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Construction Manager of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Hardware for wood, hollow metal, and FRP doors.

B. Hardware for fire-rated doors.

C. Thresholds.

D. Smoke and draft control seals.

E. Weatherstripping and gasketing.

1.3 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 1613 - Fiberglass Doors And Aluminum Frames.

C. Section 28 1000 - Access Control: Electronic access control devices.

1.4 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

C. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2017.

D. BHMA A156.3 - American National Standard for Exit Devices; 2014.

E. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.

F. BHMA A156.6 - American National Standard for Architectural Door Trim; 2015.

G. BHMA A156.16 - American National Standard for Auxiliary Hardware; 2013.

H. BHMA A156.21 - American National Standard for Thresholds; 2014.

I. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2017.

J. BHMA A156.28 - American National Standard for Recommended Practices for Mechanical Keying Systems; 2013.

K. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

L. DHI (H&S) - Sequence and Format for the Hardware Schedule; 1996.

M. DHI (KSN) - Keying Systems and Nomenclature; 1989.

N. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

O. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

Q. ITS (DIR) - Directory of Listed Products; current edition.

R. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

T. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

U. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.

V. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

W. UL (DIR) - Online Certifications Directory; Current Edition.

X. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Y. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
   1. Fuller and D'Angelo, P.C. .
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
   1. Attendance Required:
      a. Edgemont School District.
      b. Fuller and D'Angelo, P.C. .
      c. Installer's Architectural Hardware Consultant (AHC).
      d. Door Hardware Installer.
   2. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.
      c. Verify that keying and programming complies with project requirements.
      d. Establish keying submittal schedule and update requirements.
   3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Fuller and D'Angelo, P.C. , Edgemont School District, participants, and those affected by decisions made.
   5. Deliver established keying requirements to manufacturers.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).

2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
   a. Submit in vertical format.
3. Include complete description for each door listed.

D. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.

E. Samples for Verification:
1. Submit minimum size of 2 by 4 inch for sheet samples, and minimum length of 4 inch for other products.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Supplier's qualification statement.

J. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

K. Keying Schedule:
1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

L. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Edgemont School District's name and registered with manufacturer.

M. Maintenance Materials and Tools: Furnish the following for Edgemont School District's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.

1.7 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Fuller and D'Angelo, P.C. and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Edgemont School District's name and register with manufacturer.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.
   3. Locksets and Cylinders: Three years, minimum.

PART 2 PRODUCTS

2.1 General Requirements

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Locks: Provide a lock for each door, unless it's indicated that lock is not required.
   1. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's Series. As indicated in hardware sets.
   2. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.
   3. Strikes:
      a. Finish: To match lock or latch.
      b. Curved-Lip Strikes: Provide as standard, with extended lip to protect frame, unless otherwise indicated.
      c. Center Strike At Pairs of Doors: 7/8 inch lip.

D. Closers:
   1. Provide door closer on each exterior door, unless otherwise indicated.
   2. Provide door closer on each fire-rated and smoke-rated door.
   3. Mount door closers to allow doors to swing 180 deg., unless provided with integral stop.

E. Thresholds:
   1. Exterior Applications: Provide at each exterior door, unless otherwise indicated.

F. Smoke and Draft Control Seals:
   1. Provide gasketing for smoke and draft control doors that complies with local codes, requirements of assemblies tested in accordance with UL 1784.

G. Weatherstripping and Gasketing:
   1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
   2. Provide door bottom sweep on each exterior door, unless otherwise indicated.

H. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.

I. See Section 28 1000 for additional access control system requirements.

J. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
      a. Aluminum fasteners are not permitted.
      b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
   2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
      a. Self-drilling (Tek) type screws are not permitted.
   3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.

4. Provide wall grip inserts for hollow wall construction.
5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
    a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.

2.2 PERFORMANCE Requirements

A. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
    a. NYS Building Code/ICC (IBC).
    b. NFPA 101.
2. Accessibility: ADA Standards and ICC A117.1.
3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or _____ as suitable for application indicated.
5. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.3 HINGES

A. Properties:
1. Continuous Hinges: As applicable to each item specified.
    a. Geared Continuous Hinges: As applicable to each item specified.
        a) Non-handed.
        b) Anti-spinning through-fastener.
        c) UL 10C listed for fire-resistance-rated doors.
            (a) Metal Door Installation: Rated up to 90 minutes.
            (b) Wood Door Installation: Rated up to 60 minutes.
        d) Sufficient size to permit door to swing 180 degrees

B. Sizes: See Door Hardware Schedule.
1. Hinge Widths: As required to clear surrounding trim.
2. Sufficient size to allow 180 degree swing of door.

C. Finishes: See Door Hardware Schedule.
1. Fully polish hinges; front, back, and barrel.

D. Grades:

E. Types:
1. Continuous Hinges: Include geared hinges.

2.4 EXIT DEVICES

A. Properties:
1. Actuation: Full-length touchpad.
2. Chassis:
    a. Construction: Investment cast steel, zinc dichromate plated.
    b. Compatibility: Standard Stile doors.
3. Touchpads: "T" style metal touchpads and rail assemblies with matching chassis covers end caps.

4. Latch Bolts: Stainless steel deadlocking with 3/4 inch projection using latch bolt.
5. Lever Design: Match project standard lockset trims.
6. Cylinder: Include where cylinder dogging or locking trim is indicated.
7. Strike as recommended by manufacturer for application indicated.
8. Sound dampening on touch bar.
9. Dogging:
   a. Non-Fire-Resistance-Rated Devices: Cylinder 1/4 inch dogging.
   b. Fire-Resistance-Rated Devices: Manual dogging not permitted.
10. Touch bar assembly on wide style exit devices to have a 1/4 inch clearance to allow for vision frames.
11. All exposed exit device components to be of architectural metals and “true” architectural finishes.
12. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.
13. Vertical Latch Assemblies' Operation: Gravity, without use of springs.
14. Provide flush end caps.

B. Grades: Complying with BHMA A156.3, Grade 1.
   1. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.

C. Options:
   1. Furnish less bottom rod (LBR) at scheduled locations to eliminate use of floor mounted strikes.

2.5 LOCK CYLINDERS

A. Properties:
   1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
      a. Provide cams and/or tailpieces as required for locking devices.
      b. Provide cylinders with appropriate format interchangeable cores.

2.6 CYLINDRICAL LOCKS

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.

B. Properties:
   1. Mechanical Locks:
      a. Fitting modified ANSI A115.2 door preparation.
      b. Door Thickness Fit: 1-3/8 inches to 2-1/4 inches thick doors.
      c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
         a) Through-bolted anti-rotational studs.
      d. Cast stainless steel latch retractor with roller bearings for exceptionally smooth operation and superior strength and durability.
      e. Bored Hole: 2-1/8 inch diameter.
      f. Latch: Single piece tail-piece construction.
         a) Latchbolt Throw: 9/16 inch, minimum.
      g. Cylinders:
         a) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
            (a) Small format interchangeable.
      h. Lever Trim:
         a) Style: See Door Hardware Schedule.

b) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
c) Strength: Locksets outside locked lever designed to withstand minimum1,400 inch-lbs of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
d) Independent spring mechanism for each lever.
(a) Contain lever springs in the main lock hub.
e) Outside Lever Sleeve: Seamless one-piece construction.
f) Keyed Levers: Removable only after core is removed by authorized control key.

2. Electrified Locks: Same properties as standard locks, and as follows:
a. Voltage: 24 VDC.
b. Function: Electrically unlocked (Fail Secure), as indicated for each lock in Door Hardware Schedule.
c. Temperature Control Module (TCM).

C. Finishes: See Door Hardware Schedule.
1. Core Faces: Match finish of lockset.

D. Grades: Comply with BHMA A156.2, Grade 1, Series 4000, Operational Grade 1, Extra Heavy Duty.
1. Durability: Passing 50 Million cycle tests verified by third party testing agency.

E. Material: Manufacturer's stadard for specified lock.
1. Critical Latch and Chassis Components: Brass or corrosion-resistance treated steel.
2. Outside Lever Sleeve: Hardened steel alloy.

F. Products: Cylindrical locks, including mechanical and electrified types.
1. 9K (Grade 1).

2.7 CLOSERS

A. Manufacturers:

B. Properties:
1. Surface Mounted Closers: Manufacturer's standard.
a. Construction: R14 high silicon aluminum alloy.
b. Pinion: Stainless steel.
c. Hydraulic Fluid: All-weather type.
d. Arm Assembly: Standard for product specified.
a) Material: Steel.
b) Parallel arm to be a heavy-duty rigid arm.
e. Covers:
a) Type: Standard for product selected.
b) Material: Metal.
c) Finish: Painted.

C. Grades:
1. Closers: Comply with BHMA A156.4, Grade 1.
a. Underwriters Laboratories Compliance:
a) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.

D. Types:
1. Rack-and-pinion, surface-mounted. 1-1/2 inches minimum bore.

E. Options:
1. Delayed action, adjustable with an independent valve.

F. Installation:

1. Mounting: Includes surface mounted installations.
2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
3. At outswinging exterior doors, mount closer on interior side of door.
4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
5. Mount closers to allow full 180 deg swing of doors,unless specified for integral stop.

G. Products:
1. Surface Mounted:
a. 8916

2.8 PROTECTION PLATES

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.

B. Properties:
1. Plates:
a. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
b. Edges: Beveled, on four (4) unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: As indicated for each item by BHMA material and finish designation.
1. Metal Properties: Stainless steel.

E. Installation:
1. Fasteners: Countersunk screw fasteners

2.9 STOPS AND HOLDERS

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.

B. Grades:
1. Door Holders, Wall Bumpers, Floor Stops, and Dome Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

C. Material: Base metal as indicated for each item by BHMA material and finish designation.

D. Types:
1. Floor Stops: Provide with bumper floor stop.

2.10 THRESHOLDS

A. Properties:
1. Threshold Surface: Fluted horizontal grooves across full width.

B. Grades: Thresholds: Comply with BHMA A156.21.

C. Material: Base metal as indicated for each item by BHMA material and finish designation.
1. Threshold Assemblies: Aluminum.

D. Types: As applicable to project conditions. Provide barrier-free type at every location where specified.

2.11 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:

B. Properties:
1. Weatherstripping Air Leakage Performance: Not exceeding 0.3 cfm/sq ft of door opening at 0.3 inches of water pressure differential for single doors, and 0.5 cfm/sq ft of door area at 0.3 inches of water pressure differential for double doors for gasketing other than smoke control, as tested

according to ASTM E283/E283M; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

2. Adhesive-Backed Perimeter Gasketing: Slilicone gasket material applied to frame with self-adhesive.

C. Grades: Comply with BHMA A156.22.

D. Products:

2.12 ELECTRIFIED HARDWARE

A. Properties:

1. Door Position Switches: Recessed devices with balanced magnetic contacts.
   a. Power Requirement: 50mA Max, 100 VDC.
2. Power Supply Units: Manufacturer's standard.
   a. Regulatory Compliance:
      a) United States Compliance:
         (a) UL listed for Class II Output.
         (b) Comply with UL 294 Standards incorporating enhanced Access Control. communications capabilities.
   b. Enclosures: NEMA Type 1, with hinged cover and knockouts.
   c. Power: 24 VAC, 10 Amp; field-selectable.
   d. Auxiliary contacts for remote signaling.
   e. User-selectable time delay from 0 to 4 minutes.
   f. Output Distribution Board with indicator LEDs.

2.13 KEYS AND CORES

A. Manufacturers:

1. BEST, dormakaba Group: www.bestaccess.com/#sle.

B. Properties: Complying with guidelines of BHMA A156.28.

1. Provide small format interchangeable core.
2. Provide keying information in compliance with DHI (KSN) standards.
3. Keying Schedule: Arrange for a keying meeting, with Fuller and D'Angelo, P.C. , Edgemont School District and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
4. Keying: Master keyed. Coordinate and integrate with existing system
5. Include construction keying and control keying with removable core cylinders.
6. Key to existing keying system.
7. Supply keys in following quantities:
   a. Master Keys: 4 each.
   b. Construction Master Keys: 6 each.
   c. Construction Keys: 6 each.
   d. Construction Control Keys: 2 each.
8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
9. Deliver keys with identifying tags to Edgemont School District by security shipment direct from manufacturer.
10. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
11. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

2.14 FINISHES

A. Finishes: Identified in Hardware Sets.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer’s fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch.
      b. Push Plates/Pull Bars: 42 inch.
      c. Exit Devices: 40-5/16 inch.

J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 4000 - Quality Requirements.

B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

A. Adjust work under provisions of Section 01 7000 - Execution.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.5 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation activities.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.6 PROTECTION

A. Protect finished Work under provisions of Section 01 7000 - Execution.

B. Do not permit adjacent work to damage hardware or finish.

3.7 HARDWARE SCHEDULE

A. See specification section 08 7100.01 for hardware sets.

END OF SECTION

Hardware Sets

SET #01 – each opening to have:

1	Continuous Hinge	662HD-UL x HEIGHT REQUIRED	AL	ST
1	Exit Device	2103 CD	630	TR
2	Cylinders	BEST CYLINDERS AND CORES AS REQUIRED	626	BE
1	Door Pull	BY DOOR MFGR		
1	Closer	8916 505T PUSH SIDE MOUNT STOP ARM HOLD OPEN	689	DM
1	Electric Strike	F2164	630	BE
1	Card reader	RC-04 PRX-M	1S0NAS	
1	Door Position Switch	CONCEALED MAGNETIC SWITCH		
1	Power Supply	ELR152	PR	
1	Request to Exit			
1	Seals/Weatherstripping	PERIMETER SEALS BY DOOR MANUFACTURER		
1	Threshold	655A-223	ZER	
1	Kick Plate	KO050 8" x 2" LDW B4E C-SUNK HOLES	630	TR

NOTE: FRP Opening. Coordinate with FRP Door Supplier for hardware being supplied as part of FRP manufacturer's package.
NOTE: Access Control devices, Door Position Switches, Power Supplies and related accessories shall be coordinated with the Owner's Security Vendor. Prep door and frame for door position switch, as required.
Coordinate wiring with all trades.
OPERATION: Proper credential presented to access control reader retracts electric strike for access.
Access also by key. Always free egress. FRP Opening.

SET #02 – each opening to have:

2	Continuous Hinge	662HD-EPT PREP x HEIGHT REQUIRED	AL	ST
1	Set Automatic Flush Bolts	3810 X 3810	626	BE
1	Classroom Function Lockset	9K3-7R15C PATD	626	BE
2	Kick Plates	KO050 8" x 2" LDW B4E C-SUNK HOLES	630	TR
1	Dust Proof Strike	3910	630	TR
1	Gasketing	5050 B @ HEAD AND JAMBS		NA
1	Meeting Astragel	5070 CL X HEIGHT AS REQUIRED		

SET #03 – each opening to have:

1	Continuous Hinge	662HD UL x HEIGHT REQUIRED	AL	ST
1	Storeroom Function	9K3-7DI5C PATD	626	BE
1	Kick Plate	KO050 8" x 2" LDW B4E C-SUNK HOLES	630	TR
1	Mop Plate	KM050 4" x 1" LDW CSK B4E	630	TR
1	Dome Stop (Door Sp-101)	1211	626	TR
1	Overhead stop (Door Sp-102)	OH105H HEAVY DUTY CONCEALED	630	ROKWD
3E	Silencer	SR64-GRY		IVES

SET #04 – each opening to have:

1	Continuous Hinge	662HD UL x HEIGHT REQUIRED	AL	ST
1	Storeroom Function	9K3-7DI5C PATD	626	BE
1	Closers	8916 AF89P PUSH SIDE MOUNT	689	DM
1	Kick Plate	KO050 8" x 2" LDW B4E C-SUNK HOLES	630	TR
1	Concealed HD Overhead Stop	9105 x LENGTH REQUIRED	DM	
1	Seals/Weatherstripping	PERIMETER SEALS BY DOOR MANUFACTURER		
1	Threshold	655A-223	ZER	BY

NOTE: Coordinate templating of overhead stop with door closer for proper function of opening.
NOTE: FRP Opening. Coordinate with FRP Door Supplier for hardware being supplied as part of FRP manufacturer's package.

SECTION 08 8000
GLAZING

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 SECTION INCLUDES

A. Insulating glass units.

1.3 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 1613 - Fiberglass Doors And Aluminum Frames: Glazed lites installed in doors.

1.4 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

C. 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.

D. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for 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.

1.5 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

C. ASTM C1036 - Standard Specification for Flat Glass; 2016.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

F. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

H. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2017.

I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

J. GANA (SM) - GANA Sealant Manual; 2008.

K. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

L. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).

O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Samples: Submit two samples 12 by 12 inch in size of glass units.

D. Samples: Submit 6 inch long bead of glazing sealant, color as selected.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Edgemont School District's name and registered with manufacturer.

1.8 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (SM) and GANA (LGRM) for glazing installation methods.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten (10) years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five (5) years documented experience and approved by manufacturer.

1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.

D. Manufacture shall provide field inspection of the installation.

E. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type:

1. Laminated Glass: Obtain laminated-glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.
2. Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
3. Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

F. Insulating Glass products are to be permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:

1. Single Source fabrication responsibility: All fabrication processes, including Low E and reflective coatings, insulating, laminating, silkscreen, and tempering, shall be fabricated by a single Fabricator.
2. Glass fabricator to have 10 years of experience and meet ANSI / ASQC Q9002 1994.
3. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer’s written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.10 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.11 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

D. Coated-Glass Products: Manufacturer's standard form, made out to the glass fabricator, in which the coated glass manufacturer agrees to replace coated glass units that deteriorate during normal use within the specified warranty period. Deterioration of the coated glass is defined as peeling and/or cracking, or discoloration that is not attributed to glass breakage, seal failure, improper installation or cleaning and maintenance that is contrary to the manufacturer's written instructions.

1. Warranty Period:ten (10) from date of Substantial Completion

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Glass Fabricators:

1. Viracon, Inc: www.viracon.com.

B. Float Glass Manufacturers:

1. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com.

C. Laminated Glass Manufacturers:

1. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: www.viracon.com.
2. Substitutions: Refer to Section 01 2500 - Substitution Procedures

D. Substitutions: Refer to Section 01 2500 - Substitution Procedures

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.

1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.

1. In conjunction with weather barrier related materials described in other sections, as follows:

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:

1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.3 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.

1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.

2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.4 INSULATING GLASS UNITS

A. **Insulating Glass Units: Vision glazing, with Low-E coating.**
1. Applications: Exterior insulating glass glazing unless otherwise indicated.
2. Space between lites filled with argon.
3. Total Thickness: 1 inch.
4. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.38, minimum.
5. Spacer Color: Black.
6. Edge Seal:
7. Color: Black.
8. Purge interpane space with dry air, hermetically sealed.

B. **Basis of Design - Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com.**
1. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
a. Low-E Coating: Vitro Architectural Glass (formerly PPG Glass) Solarban 60 on #2 surface.
b. Glass: Clear.
a) Heavily patterned obscure glazing where indicated on drawings. or all toilet windowswhere indicated on drawings.
2. Inboard Lite: Laminated safety glass, 1/4 inch thick.
3. Use for curtain wall, storefront, and windows as indicated on drawings except where Insulated Security Glazing is indicated.
4. Substitutions: Refer to Section 01 2500 -Substitution Procedures .

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

G. Manufacturer's standard factory-glazing system that produces weather tight seal. Refer to Section 08 1113 Hollow Metal Doors and Frames, Section 08 1613 Fiberglass Doors & Aluminum Frames, Section 08 4313 Aluminum Framed Storefronts, Section 08 4413 Glazed Aluminum Curtain Walls, and Section 08 5113 Aluminum Windows.

3.4 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 8717
SAFETY AND SECURITY GLAZING FILMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Existing glazing to receive safety film.

B. Glazing assemblies to receive film are indicated on drawings.

1.3 RELATED REQUIREMENTS

A. Section 08 1613 - Fiberglass Doors and Aluminum Frames.

B. 08 8000 - Glazing

1.4 REFERENCE STANDARDS

A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers Handbook of Fundamentals.

B. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.

C. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting

D. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test)

E. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.

F. ASTM D 4830 -- Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.

H. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.

I. ASTM E 903 - Standard Methods of Test for Solar Absorbence, Reflectance and Transmittance of Materials Using Integrating Spheres.

J. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

K. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

L. ASTM F1642 - Standard Method of Test for Glazing and Glazing Systems Subject to Airblast Loadings.

M. ASTM F2912 - Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings.

N. ASTM G 26 - Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-metallic Materials Using Concentrated Natural Sunlight

O. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

P. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.

Q. GSA-TS01 - Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.

R. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing Test and classification for arena air-blast testing.

1.5 PERFORMANCE REQUIREMENTS

A. Safety Glazing Impact Performance: 400 ft-lbs impact resistance, meeting ANSI Z97.1 (Class A, Unlimited) and 16 CFR 1201 (Category 2) impact requirements with film is applied on ¼" annealed glass.

B. Blast Hazard Mitigation Performance: ASTM F1642 / ASTM F2912 "Minimal Hazard" and GSA TS01-2003 "Level 2" at minimum blast load of 8 psi and 60 psi*msec. Glazing systems vary, contact Manufacturer for more information.

C. Tear Resistance: Minimum Graves Area Tear Strength of 1,000 lbs% as measured on coated film product, without liner, per ASTM D1004.

D. Adhesion to Glass: Minimum 8 lbs/in peel strength per ASTM D3330 (Method A). E. Flammability Performance: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior use:

1. Flame Spread Index: 0
2. Smoke Developed Index: 15

E. Abrasion Resistance: Film must have a surface coating that is resistant to abrasion such that less than 5 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.

F. UV Light Rejection: Minimum of 99.9% UV light rejection (300 – 380 nm), per ASTM E903, as determined with film applied on ¼" clear glass.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Record of product certification for safety requirements.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

C. Shop Drawings: Detailing installation of film, anchoring accessories, and sealant.

D. Samples: For each film product to be used, minimum size 4 inches by 6 inches, representing actual product, color, and patterns.

E. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.

F. Specimen Warranty.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Glazing film manufacturer specializing in manufacture of safety glazing films and all primary products specified in this section, with minimum 10 years successful experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.

C. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.

D. Provide a commercial building reference list of 5 properties where the installer has applied window film. This list will include the following information:

1. Name of building.
2. The name and telephone number of a management contact.
3. Type of film.
4. Type of glass.
5. Amount of film installed.

6. Date of completion

1.8 Mock-Up:

A. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Specifying Authority.
      a. Do not proceed with remaining work until workmanship, color, and sheen are approved by the Specifying Authority.

B. 3. Refinish mock-up area as required to produce acceptable work. Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Specifying Authority.
      a. Do not proceed with remaining work until workmanship, color, and sheen are approved by the Specifying Authority.
      b. Refinish mock-up area as required to produce acceptable work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.10 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.11 MOCK-UP

A. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Specifying Authority.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by the Specifying Authority.
   3. Refinish mock-up area as required to produce acceptable work.

1.12 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 12 year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: 3M Window Film , which is located at: 3M Center Bldg. 0235-02-S-27 ; St. Paul, MN 55144-1000; Toll Free Tel: 800-480-1704; Tel: 651-733-2222; Fax: 651-737-3446; Web: www.3m.com/windowfilm.
   1. Local Contact:Tim Cox; 718.966.9690; Email. tc@ windowfilm depot.com; 151 Industrial Loop, Staten Island, NY10309

B. Substitutions: See Section 01 6000 - Product Requirements.

2.2 GLAZING FILM

A. Clear Safety and Security Window Film: 3M Safety **S70 (SH7CLARL)** Safety and Security Window Film. Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desiredthickness of the film.
   1. Physical / Mechanical Performance Properties:

a. Film Color: Clear.
b. Thickness: Nominal 7.0 mils (0.18 mm).
c. Tensile Strength (ÅSTM D 882): 25,000 psi.
d. Break Strength (ÅSTM D 882) (Per Inch Width): 175 lbs.

2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.
5. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.
   a. Visible Light Transmission (ÅSTM E 903): 86 percent.
   b. Visible Reflection (ÅSTM E 903): Not more than 10 percent.
   c. Ultraviolet Transmission (ÅSTM E 903): Less than 1 percent.
   d. Solar Heat Gain Coefficient (ÅSTM E 903): 0.79.
6. Impact Resistance for Safety Glazing: Tested on 1/8 inch (3 mm) annealed glass.
   a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
7. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.
8. GSA Rating with minimum blast pressure and impulse of 4 psi and 28 psi.msec: “3B” (Low Hazard / High Protection).
   a. GSA Rating with minimum blast pressure and impulse of 10 psi and 89 psi.msec, respectively: “3B” (Low Hazard / High Protection).

2.3 IMPACT PROTECTION ADHESIVE

A. GSA Rating of “2” / ASTM F1642 “Minimal Hazard” with blast pressure of 7 psi and 42 psi*msec blast impulse, on ¼” tempered single pane glass and 3M Impact Protection Adhesive Attachment system

B. Provide impact protection adhesive where safety film is applied over existing glass.

C. Preovide minimum 3/8"minimum on film and 3/8" on frame, excluding gasket. Refer to detail on drawings.

D. Product: Impact Protection Adhesive as manufactured by 3M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Commencement of installation constitutes acceptance of conditions.

B. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions

C. If substrate preparation is the responsibility of another installer, notify Fuller and D'Angelo, P.C. of unsatisfactory preparation before proceeding.

3.2 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. Protect adjacent surfaces.

D. Do not begin installation until substrates have been properly prepared.

3.3 INSTALLATION

A. Do not apply glazing film when surface temperature is less that 40 degrees F or if precipitation is imminent.

B. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.

C. Accurately cut film with straight edges to required sizes allowing 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required by anchorage method. Use new blade tips after 3 to 4 cuts.

D. Spray the slip solution, composed of 1 capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate positioning of film.

E. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.

F. Apply film to glass and lightly spray film with slip solution.

G. Squeegee from top to bottom of window, using a security film squeegee no wider than 5 inches. Apply firm pressure with squeegee to maximize effectiveness of slip solution removal. Spray slip solution to film as needed to reduce squeegee friction.

H. Bump film edges with a lint-free towel wrapped around edge of a 5-way tool.

I. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

J. Clean glass and anchoring accessories following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.

K. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive cleaners or brushes to avoid scratching film. Use only synthetic sponges or soft cloths.

L. Remove labels and protective covers.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry for brick veneer.

B. Section 05 5000 - Metal Fabrications for lintels.

C. Section 07 6200 - Sheet Metal Flashing and Trim.

D. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

E. Section 23 3113 - Sheetmetal Work and Related Accessories: Ductwork attachment to louvers

1.4 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.

D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum five (5) years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of experience.

C. Welding: Qualify procedures and personnel according AWS D1.2, "Structural Welding Code--Aluminum."

D. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
   1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

2.2 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load of 40 psf without damage or permanent deformation.
   2. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   3. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction.
   1. Free Area: 56%, minimum.
   2. Static Pressure Loss: 0.12 inch wg maximum per square foot of free area at velocity of 700 fpm, when tested in accordance with AMCA 500-L.
   3. Blades: Drainable.
   4. Blade Angle: 35 degreest..
   5. Frame: 4 inches deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
   6. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.
   7. Product: Use the following : Airolite K6744 with flange at wall louvers.
      a. Substitutions: See Section 01 2500 Substitution Procedures.

2.3 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper.

2.4 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils thick.

B. Color: Match existing.

2.5 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch diameter wire, 1/2 inch open weave, diagonal design.

C. Window and Door Joint Seal: Polyurethane-based joint filler:
   1. UL Classified.
   2. Product: "Great Stuff" as manufactured by Dow Chemical.
      a. "Gaps and Cracks: for joints less than 1".
      b. "Big Gap Filler" for joint over 1".
   3. Use for all filling all spaces and joints around louvers located on exterior walls.

D. Sealant: Type, as specified in Section 07 9200 - Joint Sealants.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.2 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Coordinate with installation of flashings by others.

C. Install louvers level and plumb.

D. Set sill members and sill flashing in continuous bead of sealant.

E. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

F. Secure louver frames in openings with concealed fasteners.

G. Fill all exterior spaces and joint between windows and doors solid with foam in accordance with manufacture's instructions.

1. Cut back to permit application of joint sealant.

H. Install perimeter sealant and backing rod in accordance with 07 9200 - Joint Sealants.

I. Coordinate with installation of mechanical ductwork.

3.3 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Metal stud wall framing.

B. Metal channel soffit/ceiling framing.

C. Suspended ceilings.

D. Furring channels.

E. Metal Trim

F. Cementitious backing board.

G. Gypsum wallboard.

H. Joint treatment and accessories.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 04 2000 - Unit Masonry.

C. Section 06 1000 - Rough Carpentry: Wood blocking.

D. Section 06 1010 - Roof Related Rough Carpentry.

E. Section 07 8400 - Firestopping: Top-of-wall assemblies and penetrations at fire rated walls.

F. Section 07 9200 - Joint Sealants.

G. Section 09 3000 - Tiling.

H. Section 09 7700 - Plastic Laminate Wall Surface.

1.4 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014, with Editorial Revision (2015).

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2017.

H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2018b.

I. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.

J. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.

K. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

M. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2018a.

N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

P. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.

Q. ASTM E413 - Classification for Rating Sound Insulation; 2016.

R. UL (FRD) - Fire Resistance Directory; Current Edition.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.6 QUALITY ASSURANCE

A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum Ten (10) years of experience.

C. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

1.7 REGULATORY REQUIREMENTS

A. Refer to Section 01 4100 - Regulatory Requirements.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:

1. Fire Rated Partitions: Rating as indicated on the drawings..
2. Head of Fire-Resistance-Rated Partitions: UL listed assembly No. as indicated on drawings.
3. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
4. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.2 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:

1. Marino: www.marinoware.com.

2. Substitutions: See Section 01 2500 Substitution Procedures

B. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: C-shaped with knurled or embossed faces.
      a. Minimum Base Metal Thickness: 0.0312 (20 gauge), unless noted otherwise.
      b. Depth: As indicated in drawings.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.
   4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

C. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.
   1. Products:
      a. ClarkDietrich; BlazeFrame Firestop Deflection Track: www.clarkdietrich.com.

D. Flute Cover:
   1. Corrugated strap for horizontal use to span flute areas of unprotected metal decks.
   2. Products:
      a. Clark Dietrich," (FC) Flute Cover.
         a) Minimum 20 ga.
         b) Non-structural.

E. Non-structural Framing Accessories:
   1. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

F. Ceiling Hangers: Type and size as specified in ASTM C759 for spacing required.

G. Soffit Framing
   1. Components, General: Comply with ASTM C 754 for conditions indicated.
   2. Hangers:
      a. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
   3. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch-wide flange, with ASTM A 653, G40 (Z120), hot-dip galvanized zinc coating.
      a. Depth: As indicated on drawings.
      b. Gauge: 20 gauge unless shown otherwise.
   4. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
      a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
         a) Manufacturer's standard furring systems.
      b. Main Beam: Shall be double-web construction (minimum 0.0179 inch prior to protective coating), hot dipped galvanized (per ASTM A653).
         a) HD8901: 1-1/2 inch web height, prefinished 15/16 inch flange with minimum G40 hot dipped galvanization.
      c. Primary Cross Tees: Shall be double-web steel construction (minimum 0.0179 inch prior to protective coating), hot dipped galvanized (minimum G40 or G90 per ASTM A653), web height 1-1/2 inch with rectangular bulb and prefinished 1-1/2" knurled flange.
      d. Secondary Framing Cross Tees : Shall be double web steel construction (minimum 0.0179 inch prior to protective coating), hot dipped galvanized (minimum G40, web height 1-1/2 inch rectangular bulb and 15/16 inch flange (XL8341)

e. Hat Furring Channel, HD8940: Shall be 48 inch x 1-3/8 inch x 7/8 inch, hot dipped galvanized steel (minimum G40 per ASTM A653); compatible with HD8901 and HD8906 main beams.

f. Wall Molding:
   a) HD7859: Hot dipped galvanized (minimum G40), hemmed angle molding, 1-1/4 inch height with 1-1/4 inch flange.

g. Clips:
   a) MBAC - Main Beam Adapter Clip
   b) DWACS, DW50, DW58 - Drywall Attachment Clip for transitions to acoustical ceilings
   c) XTAC - Cross Tee Adapter Clip

h. Screws for wallboard application shall be bugle head screws in accordance with thickness of material used.

2.3 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. Georgia-Pacific Gypsum: www.gpgypsum.com.
   2. National Gypsum Company: www.nationalgypsum.com.
   3. USG Corporation: www.usg.com.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. **Mold resistant board is required at all locations.**
   3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch
      b. Soffits and Ceilings: 5/8 inch.

C. Abuse Resistant Wallboard:
   1. Application: Face layer of all partitions unless noted otherwise.
   2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   3. Indentation: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
   4. Soft Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
   5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   6. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
   7. Type: Fire-resistance-rated Type X, UL or WH listed.
   8. Thickness: 5/8 inch.
   9. Edges: Tapered.
   10. Paper-Faced Products:
      a. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold Guard Abuse-Resistant: www.gpgypsum.com/#sle.
      b. National Gypsum Company; Gold Bond Hi-Abuse XP Gypsum Board: www.nationalgypsum.com/#sle.
      c. Substitutions: .See Section 01 2500 Substitution Procedures

D. Cementitious Backing Board For Wet Areas:
   1. Application: Surfaces behind tile in wet areas including cafeteria and kitchen galley and janitor closet.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
   a. Thickness: 5/8 inch.
   b. Products:
      a) National Gypsum Company: www.nationalgypsum.com.
      b) USG Corporation: www.usg.com.
      c) Substitutions: See Section 01 2500 Substitution Procedures

E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Soffits and ceilings, unless otherwise indicated.
   2. Thickness: 5/8 inch.
   3. Edges: Tapered.
   4. Products:
      a. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board: www.gpgypsum.com/#sle.

2.4 GYPSUM WALLBOARD ACCESSORIES

A. Mineral Fiber Batt Insulation: See Section 07 2100

B. Acoustic Insulation: See Section 07 2100

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel, unless noted otherwise.
   1. Corner Beads: Low profile, for 90 degree outside corners.
      a. Products:
         a) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com.
   2. L-Trim with Tear-Away Strip: Sized to fit the thickness gypsum wallboard.
      a. Products:
         a) Phillips Manufacturing Co; gripSTIK L-Tear: www.phillipsmfg.com.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Mold resistant and asbestos free.
   2. Joint Compound: Drying type, vinyl-based, ready-mixed.
      a. Products:
         a) CertainTeed Corporation; Extreme All-Purpose Joint Compound: www.certainteed.com.
         b) Substitutions: See Section 01 2500 Substitution Procedures

E. Abuse Resistant Finishes:
   1. Acrylic, water-based, non-textured, high build, tintable primer and surfacer.

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

H. Utility angle: 2"x 2" 20 ga. for attachments of intersection framing and right angle corner enclosures.

I. Flat straps: 6", 16 ga. use for stud bridging.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Provide metal Bracing: at midpoint up to 8' 0"; at third point over 8'-0".

C. Studs: Space studs at 16 inches on center, unless shown otherwise
   1. Extend partition framing to structure in all locations.

D. **Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs minimum 16 gauge**.

E. Standard Wall Furring: Install at masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 16 inches on center.
   1. Orientation: Horizontal.
   2. Spacing: As indicated.

F. Blocking: Install blocking for support of hardware. Comply with Section 06 1000 Rough Carpentry.

G. Suspended Ceiling and Soffits: Space framing and furring members as indicated.

3.3 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.4 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

F. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

A. Corner Beads: Install at external corners, using longest practical lengths.

B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.6 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding are not required at base layer of double-layer applications.

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.7 FIRE RATED WALL MARKING AND IDENTIFICATION

A. For all walls or partitions indicated to be fire rated, or smoke rated, where there is an accessible concealed floor, ceiling or attic space adjacent to said wall. Contractor shall permanently mark with signs or stenciling within he concealed space, in accordance with IBC 703.7 in concealed spaces.
   1. Identifications shall be located within 15 feet of the end of each wall or partition and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
   2. Identifications shall include lettering not less than 3 inches in height with a minimum 3/8 inch stroke width in a contrasting color incorporating the wording " FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS".

3.8 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.9 FINISH LEVEL SCHEDULE

A. Level 1: Above finished ceilings concealed from view.

B. Level 2: Utility areas and areas behind cabinetry.

C. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish.

D. Level 5: Walls and ceilings scheduled to receive semi-gloss or gloss paint finish.

END OF SECTION

SECTION 09 2662
GYPSUM SHEATHING

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 includes:
   1. Gypsum sheathing attached to steel framing members in exterior walls and ceilings (behind exterior finish).

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section - 05 4000 - Cold-Formed Metal Framing.
   2. Section - 07 5323 - Ethylene-Propylene-Diene-Monomer Roofing (EPDM) for gypsum based cover board and sheathing.
   3. Section - 09 2116 - Gypsum Board Assemblies for furring.

1.3 DEFINITIONS:

A. Gypsum Board Construction Terminology Standard: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this Section or other referenced standards.

1.4 SUBMITTALS:

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
   1. Product data for each grade of gypsum sheathing indicated.
   2. Product data for air/moisture resistant barrier and tape.
   3. Research reports or evaluation reports from the model code organization acceptable to authorities having jurisdiction evidencing compliance of air-infiltration barrier with building code in effect for Project.
   4. Sample: 6” x 6” sheathing.

1.5 QUALITY ASSURANCE:

A. Fire-Test-Response Characteristics: Where gypsum sheathing is part of fire-resistance-rated assemblies, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Resistance Ratings: As indicated by reference to GA File Nos. in GA 600 "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Single-Source Responsibility: Obtain gypsum sheathing for Project from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver gypsum sheathing board and related materials in original packages bearing brand name and identification of manufacturer.

B. Store gypsum sheathing board so that it is protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, or other causes. Neatly stack gypsum sheathing boards flat on leveled supports off the ground under protective covering.

C. Handle gypsum sheathing board to prevent damaging edges, ends, backs, or faces.

1.7 SEQUENCING AND SCHEDULING:

A. Sequence installing gypsum sheathing board with installing exterior cladding to comply with requirements indicated below:

B. Do not leave gypsum-sheathing board exposed to weather for more than 1 month or for more than 6 months if protected as indicated in Part 3 "Protection" article.

PART 2 - PRODUCTS

2.1 GYPSUM SHEATHING BOARD:

A. Glass-Mat Gypsum Board: Gypsum board designed as an exterior substrate for a weather barrier, consisting of a noncombustible water-resistant core, essentially gypsum, surfaced with glass mats on face and back, partially or completely embedded in core, and with unsurfaced square edges. Comply with ASTM C 1177 and requirements indicated below:
   1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   2. Fungal Resistance: No fungal growth when tested in accordance with ASTM G21.
   3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Core Type: Type X.
   5. Thickness: 5/8 inch,unless indicated otherwise
   6. Edges: Square.
   7. Size: 4 feet by 8 feet
   8. Use: All gypsum sheathing applications.

B. Products: Subject to compliance with requirements, provide one of the following:
   1. Dens-Glass Gold Fireguard Exterior Guard as manufactured by Georgia-Pacific Corp or equivalent.

C. Accessory Materials:
   1. Fasteners: Type S-12, minimum 1 3/4” for 5/8, stainless steel drill screws to attach to metal framing.

D. Substitutions: 01 2500 - Substitution Procedures

2.2 WEATHER RESISTIVE BARRIER

A. Furnish and install air barrier/weather resistant barrier over exterior wall sheathing at all locations regardless of whether or not indicated on drawings to protect exterior sheathing.

B. Manufacturer: DuPont Company ; Tyvek Commercial Wrap.
   1. Air barrier sheet mechanically fastened.
   2. Class A. Flame spread 10 smoke developed :10

PART 3 - EXECUTION

3.1 GYPSUM SHEATHING BOARD

A. Preparation: Examine subframing; verify that surface of framing and furring members to receive sheathing does not vary more than 1/4" from the placement of faces of adjacent members.

B. Installation: General: Install gypsum sheathing to comply with manufacturer's instructions, GA-253, and the following:
   1. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.
   2. Coordinate sheathing installation with flashing and joint sealant installation so that these combined materials are installed in the sequence and manner that prevents exterior moisture from passing through completed exterior wall assembly.
   3. Apply fasteners so that screw heads bear tightly against face of gypsum sheathing boards but do not cut into face paper.
   4. Do not bridge building expansion joints with gypsum sheathing; cut and space edges to match
      a. spacing of structural support elements.
   5. Install sheathing with gold side out.

6. Install gypsum-sheathing boards with edges centered over flanges of steel studs or furring. Abut ends and edges of each board with those of adjoining boards. Screw-attach boards at perimeter and within field of board to each steel stud as follows:
   a. Metal framing: Fasten sheathing to metal framing with screws spaced 8" o.c.at perimeter where there are framing supports; and 8" o.c. along intermediate framing in field.
   b. Locate fasteners minimum 3/8" from edges and ends of sheathing panels.
   c. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.
   d. Use maximum lengths possible to minimize number of joints.
   e. Metal framing: Fasten sheathing to metal framing with screws spaced 8" o. c. at perimeter

3.2 WEATHER RESISTIVE BARRIER

A. Install in accordance with manufacturer's instructions.
   1. Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

3.3 PROTECTION:

A. Protect cutouts, corners, and joints in the sheathing by filling with a flexible sealant or by applying sheathing tape recommended by sheathing manufacturer at the time sheathing is applied.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Preparation.

B. Tile for wall applications.

C. Stone thresholds.

D. Ceramic trim.

1.3 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements.

B. Section 03 5400 - Cast Underlayment.

C. Section 09 2116 - Gypsum Board Assemblies: Cement Board for wall backerboard.

1.4 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.

1. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
2. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar; 2012 (Revised).
3. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).
4. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014.
5. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2012.
6. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile; 2008 (Reaffirmed 2013).

B. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2017.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

F. Maintenance Materials: Furnish the following for Edgemont School District's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Tile: 10 square feet of each size, color, and surface finish combination.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.7 MOCK-UPs

A. See Section 01 4000 - Quality Requirements for general requirements for mock-up.

B. Construct tile mock-up incorporating all components specified for the location.
   1. Minimum size of mock-up is 10' x 10'.
   2. Approved mock-up may remain as part of work.
   3. Include wall and door threshold.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.9 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.1 TILE

A. Glazed Wall Tile (GLT): ANSI A137.1 standard grade and as follows:
   1. Size 6 x 18 inches.
   2. Edges: Cushioned.
   3. Color(s): As indicated on drawings.
   4. Trim Units: Matching bullnose and flat top cove. Size to match shapes.
   5. Products:
      a. Dal-Tile Corporation: www.dalitile.com.
      b. Wall Classic Series.
   6. Substitutions: Section 01 2500 Substitution Procedures.

B. Ceramic Tile (CT): ANSI A137.1 standard grade and as follows:
   1. Size 3 x 6 inches.
   2. Edges: Cushioned.
   3. Color(s): As indicated on drawings.
   4. Trim Units: Matching bullnose and flat top cove. Size to match shapes.
   5. Products:
      a. Dal-Tile Corporation: www.dalitile.com.
      b. Wall Classic Series.
   6. Substitutions: Section 01 2500 Substitution Procedures.

2.2 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
   1. Applications:
      a. Open Edges: Bullnose.
      b. Inside Corners: Jointed.
      c. Floor to Wall Joints: Cove base.

2. Manufacturers: Same as for tile.

B. Thresholds: Full width of door frame; beveled edge on both long edges; without holes, cracks, or open seams. Refer to details.
1. Material: Travertine, honed finish where indicated on drawings.
2. Profile: Hollywood level double sided.

2.3 SETTING MATERIALS

A. Manufacturers:
1. Mapei Corporation. Product: Keraflex Plus..
2. Substitutions: Section 01 2500 Substitution Procedures.
3. Applications: Use this type of bond coat for all walls.

2.4 PRIMER.

A. For use over existing concrete.
1. Mapei ECO Prim Grip primer.

2.5 GROUTS

A. Manufacturers:
1. Mapei Corporation ; Product Mapei Ultracolor, Plus FA
a. Use for all area all walls.
b. Joint Thickness: 1/16".
c. Color:
a) As selected by Architect.
2. Substitutions: Section 01 2500 Substitution Procedures.

2.6 ACCESSORY MATERIALS

A. 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

B. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.
1. Products: MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout
a. Provide sealer coat over all tile areas.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
1. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove existing setting bed substrate in the toilets.

B. Crack and Joint Repair: Concrete must be structurally sound, solid, dry, and free of laitance, dirt, debris, coatings, sealers, solvent base adhesives and any contaminant that may act as a bond breaker as per ANSI A108.01.
1. Prepare substrate in accordance with adhesive manufacturer's instructions.

2. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface up to 1/2".
3. Dry diamond blade may be used to prepare cracks and create a clean surface for bonding.
4. Do not use sweeping compounds, solvents or acid etching to prepare the surface.
5. Cracks or joints should be free of dust, dirt, oils and any other debris.
6. Prohibit traffic until filler is fully cured.

C. Install concrete underlayment.

D. All concrete substrates must be solid, thoroughly clean and free of oil, wax, grease, asphalt, latex and gypsum compounds, curing compounds, sealers and any contaminant that might act as a bond breaker.

E. Protect surrounding work from damage.

F. Vacuum clean surfaces and damp clean.

3.3 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1A thru A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Install thresholds where indicated.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep control and expansion joints free of mortar, grout, and adhesive. Refer to TCNA (HB) EJ 171 for location and frequency of joints.

H. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - WALL TILE

A. Over cementitious backer units install in accordance with TCNA (HB) Method W223, with specified adhesive and grout. adhesive.

B. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.5 CLEANING

A. Clean tile and grout surfaces.

B. Provide sealer coat in accordance with manufacturer's instructions.

3.6 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Removals.

B. New and Replacement of acoustical panels and suspended grid as required and indicated on drawings.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements for coordination and coordination drawings.

B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

C. Section 07 9200 - Joint Sealants.

D. Section 09 2116 - Gypsum Board Assemblies.

E. Divisions 23 and 26 for air outlets and inlets, light fixtures, and fire alarm.

1.4 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.

D. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

E. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

G. ASTM C841 - - Standard Specification for Installation of Interior Lathing and Furring

H. ASTM D3273 - Standard Test Method for resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.

K. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.

L. ASTM E1111/E1111M - Standard Test Method for Measuring the Interzone Attenuation of Open Office Components.

M. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

N. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum; 2016.

O. ICC ES AC 156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 12 x 12 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 12 inches long, of suspension system main runner.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at New York.

B. Fire Performance: ASTM E84 surface burning characteristics. Flame Spread index 25 or less. Smoke development index 50 or less. (UL Labeled) Class A in accordance to ASTM E1264.

C. Fire Performance Details: Suspension ceiling components will feature markings of applicable testing and inspecting organization

D. Fire-Resistance: As specified in ASTM E119 and listed in the determined ceiling design in the Underwriters Laboratories Fire Resistance Directory

E. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

F. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

G. Installers Qualifications: Company specializing in the installation of acoustical ceilings specified in this section with minimum 5 years documented experience.

H. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Owner’s Representative.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by. Owner’s Representative
3. Refinish mock-up area as required to produce acceptable work.

I. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

J. Pre-installation Conference: Conduct conference at Project site minimum one week before removal and installation. Agenda shall include project conditions, coordination with work of other trades, and layout of items which penetrate ceilings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet conditions such as concrete, plaster, paint, and adhesives have been completed and cured.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Protect system components from excessive moisture in shipment, storage, and handling

1.8 WARRANTY

A. Warranty: Provide manufacturer's standard warranty against manufacturing defects in material or workmanship when installed in accordance with the current CISCA Handbook and ASTM C367.

1. Warranty Period: .
2. Acoustical Panel: 30 years

3. Suspension System: 40 years.

1.9 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Rockfon: www.rockfon.com/#sle.
   2. Substitutions: See Section 01 2500 - Substitution Procedures.

2.2 ACOUSTICAL UNITS

A. Acoustical Tile Type ACT-2: Painted mineral fiber, ASTM E1264 Type III, Form: 1, Pattern E1 with the following characteristics:
   1. Size: 24 by 24 inches.
   2. Thickness: 3/4 inches.
   3. Light Reflectance: 86 percent, determined in accordance with ASTM E1264.
   4. NRC Range: 0.90 determined in accordance with ASTM E1264.
   5. Articulation Class (AC): 180, determined in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
   7. Sag/Humidity Resistance: Standard
   8. Fire Performance: Class A.
   9. Edge: Square.
   10. Surface Color: As indicated on drawings.
   11. Suspension System: Exposed grid.
   12. Products:
      a. Rockfon Alaska #10100.
      b. Substitutions: See Section 01 2500 - Substitution Procedures.

B. Acoustical Panels, Type ACT-1: Rockfon Hygienic Plus, with the following characteristics:
   1. Classification: ASTM E1264 Type XX
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Light Reflectance: 0.83 percent, determined in accordance with ASTM E1264.
   5. NRC Range: 0.90, determined in accordance with ASTME1264.
   6. Panel Edge: Square.
   7. Color: As indicated on drawings.
   8. Suspension System: Exposed grid.
   9. Products:
      a. Rockfon Hygienic Plus #31100.

2.3 SUSPENSION SYSTEM(S)

A. Manufacturers:
   1. Chicago Metallic Double Web Intermediate Duty Non-Fire Rated Suspension System.

B. Materials:
   1. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE 7 and ICC ES AC 156.
   2. Basic Steel Material and Finish: Commercial quality, CS Type A to ASTM A653/A653M, hot-dip galvanized to not less than G30 zinc coating designation.

3. Main Tees and Cross Tees: All suspension main tee and cross tee components are manufactured from commercial quality steel with factory punched cross tee slots, hanger holes, and integral bayonet-style end couplings. The main tees are capped with steel capping affixed to a flange and is coated with factory applied baked-on enamel paint.
4. Structural Classification Standard: ASTM C635/C635M Intermediate Duty.

C. Color: Standard white unless otherwise noted.

D. Specified Product: “Chicago Metallic Snap-Grid™ 250 (15/16) Exposed” by ROCKFON.

E. Perimeter Treatment Components:
1. Angle Moldings: Manufactured from 0.020” thick steel and finished identical to main tees and cross tees.

2.4 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

D. Perimeter Moldings: Same metal and finish as grid.
1. Minimum 7/8" horizontal flange

E. Moldings: Same material and finish as Grid.
1. Minimum 7/8" horizontal flange perimeter angle.
2. Extended Aluminum Edge Trim: At Exposed Grid provide L-shaped molding for mounting at same elevation as face of grid.
3. Extruded Aluminum Edge Trim: Axiom Classic 8" edge trim as manufactured by Armstrong Ceiling Systems.
a. Curved Trim: Provide space plates, attachment and other clips as required.
b. Refer to drawings for locations.

F. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 9200 - Joint Sealants.

G. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.3 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Install in bed of acoustical sealant.
2. Use longest practical lengths.

D. Install metal acoustical ceiling suspension assemblies to comply with ASTM C636/C636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

E. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

3.4 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

F. Install seismic clips or stabilizer bars as per code requirements.

3.5 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.6 ADJUSTING AND CLEANING

A. Replace damaged or broken material, Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with mfg,, touch up procedures using touch up paint as required for small nicks and minor scratches in the surface, Remove and replace any work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
   1. Provide touch up kit for Owner's use.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Removals.

B. Crack repair.

C. Underlayment.

D. Moisture mitigation testing.

E. Resilient tile flooring.

F. Resilient base.

G. Installation accessories.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 5400 - Cast Underlayment.

1.4 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.

B. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring; 2006 (Reapproved 2018).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

E. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.

F. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.

G. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

H. ASTM F-1869 Test Method for Measuring Moisture Vapor Emissions in Concrete.

I. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015, with Editorial Revision (2016).

J. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

K. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs.

L. ASTM F2420 - Standard Test Method for Determining Relative Humidity on the Surface of Concrete

M. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.

N. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 36" x 36" in size illustrating color and pattern for each resilient flooring product specified.

D. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. MSDS (Material Safety Data Sheets) should be submitted for all adhesives used:
   1. Membrane, primer, patch, leveler, heat weld rod, cold weld, liquid wax and cleaning agents

I. Maintenance Materials: Furnish the following for 's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Materials: Furnish one box of tile for each fifty boxes or fraction thereof, for each type, color, pattern and size of the tile installed, from same manufactured lot as materials installed.
      a. Deliver extra tile to Owner after completion of work.
      b. Furnish tiles in protective packaging with identifying labels.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum 10 years documented experience, with resilient flooring of types equivalent to those specified.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions

1.8 MOCK UP

A. Field Samples per Section 001 4000 - Quality Requirements. Provide field samples, dry laid, to demonstrate aesthetic effects of materials in place.

1.9 FIELD CONDITIONS

A. Store materials for not less than 48 hours before, during, and 72 hours after installation, in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.10 PRE-INSTALLATION TESTING

A. Conduct pre-installation testing as follows:
   1. ASTM F-1869 Test Method for Measuring Moisture Vapor Emissions in Concrete Maximum: 3 lbs/1000 SF
   2. ASTM F-2170 Test Method for Determining Relative Humidity in Concrete: Maximum RH: 55%.

1.11 WARRANTY

A. Provide manufacturer's non-prorated twenty-five year limited warranty to be free from defects in material and workmanship, under normal use and service, to repair or replace all defective tiles including reasonable labor.

PART 2 PRODUCTS

2.1 TILE FLOORING

A. Vinyl Tile: Monolithic solid vinyl tile.
   1. Manufacturer: Patcraft

2. Product: ADMIX 36 X 3 6, I347V
3. Class ASTM F1700: ASTM F1700 Class I – monolithic solid vinyl tile Type A (smooth).
4. Overall Thickness: 0.126 inches (3.2 mm).
5. Nominal Dimensions: Refer to drawings.
6. Installation: Glue Down

B. Installation Material
1. Adhesives:
a. Shaw 4151 for high moisture, 99% RH ;10 lbs. pH 12.
2. Primer: Shaw 9050
3. Barrier Coat Floor Encapsulation: Shaw 9000
4. Cove Base Accessories:
a. Angle Profile
5. Floor Polish

C. Performance:
1. Slip Resistance ASTM D2047: ADA Compliant
2. Static Load Limit ASTM F970: 1500 psi
3. Residual Indentation F1914: passes , 8%
4. Flexibility ASTM F137: Passes
5. Resistance to Heat ASTM F1514: Passes
6. Resistance to Light ASTM F1515: Passes
7. Resistance to Chemicals ASTM F925: Passes
8. Radiant Flux ASTM E648: / 0.45 W/sq. cm., Class I
9. Smoke Density ASTM E662: Passes, <450

2.2 STAIR AND RAMP COVERING

A. Stair Treads with Integral Risers: Rubber; full height of riser, full width and depth of tread in one piece; tapered thickness.
1. Manufacturers:
a. CBC Flooring: www.cbcflooring.com
2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
4. Nominal Thckness: 0.10" (2.5mm).
5. Nosing: Round with contrasting color.
6. Tread Texture: Raised.
7. Color: As indicated on drawings.

B. Ramp Coverings:
1. Manufacturer: CBS Flooring: www.cbcflooring.com
2. 36" x 36" linear textured, slip-resistant surface.
3. Nominal thickness 0.10" (2.5 mm)

2.3 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and Style A straight for carpet installation as follows:
1. Manufacturers:
a. Johnsonite, a Tarkett Company: www.johnsonite.com.
b. Substitutions: See Section 01 2500 - Substitution Procedures.
2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.

3. Height: 4 inch.
4. Thickness: 0.125 inch (3.2 mm).
5. Finish: Satin
6. Length: 4 foot (1.2 m) sections
7. Color: As indicated on drawings.
8. Accessories: Premolded external corners and internal corners.

2.4 ACCESSORIES

A. Moldings, Transition and Edge Strips, same material as flooring.

B. Trowelable Leveling and Patching Compounds: Latex-modified, Portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.

C. Primers and Seam Sealer: Waterproof, types recommended by flooring manufacturer
1. VOC Content Limits: As specified in Section 01 6116.

D. Tile Adhesive: Latex adhesive, non-flammable, moisture and alkali resistant bond.
1. Adhesive shall be as recommended by the manufacturer, compatible with tile and substrate.

E. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Test as Follows:
a. Internal Relative Humidity: ASTM F2170.
2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Moisture Testing: Moisture testing shall be performed using ASTM test method ASTM F 2170 Relative Humidity Test. The acceptable test result when using test method F 2170 should not exceed seventy five per cent (75%) AND pH readings should not exceed 9.0.

E. Verify that existing concrete sub floor do not containing curing compound by placing 1/4 cup of water on surface. If water beads up scarify surface.

F. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Concrete substrate that fully conforms to the requirements of ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring is required, or as detailed in the manufacturer's Installation Guide.

C. Crack and Joint Repair: Concrete must be structurally sound, solid, dry, and free of laitance, dirt, debris, coatings, sealers, solvent base adhesives and any contaminant that may act as a bond breaker.
1. Dry diamond blade may be used to prepare cracks and create a clean surface for bonding.
2. Do not use sweeping compounds, solvents or acid etching to prepare the surface.
3. Cracks or joints should be free of dust, dirt, oils and any other debris.
4. New concrete should be fully cured and free of movement.

D. Underlayment: All concrete substrates must be solid, thoroughly clean and free of oil, wax, grease, asphalt, latex and gypsum compounds, curing compounds, sealers and any contaminant that might act as a bond breaker.
   1. **Mechanically profile with grinder 100% of all existing substrates receiving resilient flooring. Provide dust control as required.**
      a. After profiling test substrate by place drop of water, or other means to insure all coatings, sealers etc have been removed. Repeat profiling if necessary.

3.3 INSTALLATION GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Crack and Joint Repair: During set-up of cartridge (purging air and balancing) and initial dispensing of material, keep cartridge and nozzle assembly pointed straight up to prevent material in the nozzle from flowing back into the cartridge.
   1. Apply continuously once opened to prevent the tip from becoming clogged.
   2. Immediately broadcast clean sand size #30 or #35 into the freshly applied material.
   3. Fill the crack, joint or repair area so the material is slightly higher than the face of the concrete slab.
   4. Allow to set for approximately 10 to 15 minutes (at 75° F), and then use a sharp razor scraper to shave excess material from the top of the slab.

D. Underlayment: Installed from a true featheredge up to 1/2 in. (12.7 mm).
   1. Verify crack/joint repair has dried thoroughly.
   2. Use the least amount possible to attain the desired smoothness.
   3. Allow to dry in accordance to manufacturer's recommendations.

   Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set as recommended by the manufacturer.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.

E. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

F. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Resilient Strips: Attach to substrate using adhesive.

G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

H. Install flooring in recessed floor access covers, maintaining floor pattern.

I. Install feature strips where indicated.

J. Do not mix manufacturing batches of a color within the same area.

K. Do not install resilient flooring over building expansion joints.

L. Do not install defective or damaged resilient flooring.

M. Layout resilient flooring to provide equal size at perimeter. Adjust layout as necessary to reduce the amount of resilient flooring which is cut to less than half full width.

N. Install resilient flooring without voids at seams. Lay seams together without stress.

O. Remove excess adhesive immediately

3.4 INSTALLATION TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Install square tile to pattern shown on drawings. Allow minimum 1/2 full size tile width at room or area perimeter.

C. Install plank tile with a random offset of at least 6 inches from adjacent rows.

D. Lay out tiles to match existing.

E. Roll the plank or tile with a 3-section 100 lb. roller. Re-roll the floor within the working time of the adhesive. Continue to roll the floor throughout the working day to ensure a proper bond.

3.5 INSTALLATION RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.6 INSTALATION - STAIR COVERING

A. Install stair coverings in one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

C. Perform initial maintenance procedures in accordance with manufacturer's requirements.

3.7 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

C. Full maintenance instructions shall be provided by the manufacturer

3.8 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation and 72 hours heavy rolling loads.

B. Use floor protection after installation. DO NOT use a plastic adhesive-based protection system.

3.9 SCHEDULE

A. Refer to Finish Schedule on drawings.

END OF SECTION

SECTION 09 7700
PLASTIC LAMINATE WALL SURFACES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Pre-manufactured panel system including mounting hardware and specified accessories.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   1. Class 1/A - Flame Spread 0-25, Smoke Developed 450 or less.
   2. Class 2/B - Flame Spread 26-75, Smoke Developed 450 or less.

B. Architectural Woodwork Institute (AWI) Quality Standards.

C. National Electrical Manufacturer’s Association (NEMA)

1.4 SUBMITTALS

A. Submit under provisions of Section 01 3000 - Administrative Requirements.

B. Product Data: Manufacturer's on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with adjacent work.

D. Selection Samples: For each finish product specified, one complete set of color samples representing manufacturer's standard range of available colors and patterns.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Firm with a minumum three (3) years experienced in successful production of wall systems similar to that indicated for the Project, with sufficient production capacity to produce required units without causing delay in the work.
   2. Provide certificate signed by panel manufacturer certifying that products comply with specified requirements.

B. Installer Qualifications: Demonstrate five (5) years successful experience in installing architectural woodwork similar in type and quality to those required for this project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver wall system until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate wall system have been completed in installation areas as specified by AWI 1700-G-3.

B. If panels are stored prior to installation, store them flat in completely enclosed areas, out of the weather. If panels must be stored in other than installation areas, store only in areas where environmental conditions comply with manufacturers recommendations. Do not expose panels to continuous direct sunlight, nor to extremes in temperature and humidity. Store products in manufacturer's packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with direction of YPS Office of Facilities Management.

1.7 PROJECT CONDITIONS

A. Do not deliver or install wall system until building is enclosed, wet work is complete and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period as specified by AWI 1700-G-3.

B. Do not install wall system until normal lighting conditions exist. Normal lighting conditions are described as those in place when the project is finished. This includes, but not limited to, design lighting (wall washers, spot lights and flood lights, and similar fixtures) and natural lighting.

C. Wall, ceilings, floors, and openings must be level, plumb, straight, in-line and square as specified by AWI 1700-G-3.

D. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer. Do not install products under environmental conditions outside manufacturer's absolute limits. Panels shall be conditioned in the environment in which they will be installed for a minimum of 72 hours prior to installation. The recommended environment is 75 degrees F (24 degrees C) and 45 percent relative humidity.

E. Environmental Conditions: Comply with Woodwork Manufacturer's recommendations for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

1.8 WARRANTY

A. Manufacturer warrants any product it has manufactured and sold against defects in materials or workmanship for a period of five years from the date of original purchase and acceptance for use. This warranty extends to products assembled / installed and used in the manner intended and does not cover damage or failure caused by: misuse, abuse or accidents, exposure to extreme temperature, improper installation, improper maintenance and exposure to water or excessive humidity or excessive moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Panel Specialists, Inc.; 3115 Range Rd., Temple, TX 76504. ASD. Toll Free Tel: (800) 947-9422. Tel: (254) 774-9800. Fax: (254) 774-7222. Email: psiwalls@panelspec.com. Web: <http://www.panelspec.com>

B. Substitutions: Referr to 01 2500 - Substitution Procedures.

2.2 PANEL SYSTEMS

A. Provide prefinished decorative panels where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

B. Comply with applicable requirements of "Architectural Woodwork Quality Standards" in the production and installation of the wall panel system as published by the Architectural Woodwork Institute (AWl) unless otherwise indicated.

C. Panel System: #312 as manufactured by Panel Specialists, Inc. A progressive panel system with an exposed ½ inch (12mm) recessed horizontal channel reveal and a 1/16 inch (1.4mm) vertical divider molding creating a horizontal and vertical reveal between edge banded panels. Recommended for vertical and horizontal interior installations. Maximum panel length for horizontal installations is 96 inches (2438 mm).

1. Panel Thickness: 7/16 inches (11.1 mm).
2. Horizontal Reveal: System to provide a recessed channel reveal of ½ inch (12mm) between panels.
3. Vertical Reveal: System to provide a 1/16 inch (1.5mm) reveal between panels.
4. Panel Edge Finish: Panel edges to be finish with .018 inch (.5mm) PVC edge banding or wood veneer.

5. Panel Finish: Refer to Finish Schedule ondrawings.
6. Main Laminated Panel Fire Rating:
   a. Fire Rating: ASTM E84, Class B.
7. Tack Board Fire Rating: Resilient tack board as scheduled.
   a. Fire Rating: ASTM E84, Class B.
8. Panel Dimensions: Refer to drawings.
9. Molding: Provide manufacturer's accessories

   a) #312 ½ in. Recess Channel Divider Molding
   b) #302A Vertical Divider Molding
   c) (#103-90, 103-90F) 90 degrees outside Corner Molding
   d) #304-90 End Cap for top and bottom of 90 degrees outside Corner Molding
   e) #304 Edge Trim Molding
   f) #304A Edge Trim Molding(2-piece)
10. Finishes:
   a. Panel Face:
      a) Refer to drawings for all types.
      b) 1. Finish #1: Plastic Laminate
   b. Panel Face Pattern Direction:
      a) 1. Horizontal
   c. Panel Edge Banding: (select one or enter custom color choice)
      a) 2. .5mm PVC Platinum
   d. Aluminum Molding Finish: (select one or enter custom color choice)
      a) 1. Clear Anodize

2.3 MATERIALS

A. High Pressure Decorative Laminates (VGS,VGP,VGF & HGS) and non-decorative backers (BKV) used to surface wall panels systems shall be manufactured to meet or exceed the National Electrical Manufacturing Association (NEMA LD3-2005) for thickness, performance properties and appearance.

B. Medium Density Fiberboard (MDF): 45# density shall be used in Class III panel composition. Fire-rated MDF shall be used for Class I and Class II panel composition (refer to AW1 Section 200).

C. Bulletin Board:
   1. Linoleum resilient homogeneous tackable surface material shall be of natural materials consisting linseed oil, granulated cork, resin binders and dry pigments, mixed and bonded to a natural jute backing.
   2. Linoleum as scheduled in the Room Finish Schedule or as indicated on the drawings.
   3. Resilient tackable panel from manufacturer’s standard line.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared according to AWI 1700-G-3.

B. If substrate preparation is the responsibility of another installer, notify YPS Office of Facilities Management of unsatisfactory preparation before proceeding.

3.2 FIELD DIMENSIONS

A. Where wall system is indicated to be fitted to other construction, check actual dimensions of other constructions by accurate field measurements before manufacturing wall system; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

B. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with manufacture of wall system without field measurements coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

3.3 PREPARATION

A. Panels must be acclimated to ambient temperature and humidity conditions in accordance with manufacturer's specifications prior to installation. Refer to PSI installation guide for proper, handling, storage and acclimation procedures.

B. Clean surfaces thoroughly prior to installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

D. Prepare existing wall by removing all items. Grind and projections on wall to provide substrate within specified tolerances.

3.4 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Field cutting of all wall systems should be accomplished using carbide tools. All face penetrations and cutouts should have a minimal 1/8 inch (3 mm) radius in corners according to NEMA Standards Publication LD 3-2005.

C. All wall systems should receive an "S" bead of panel mastic on the back of the panel during installation.

D. Fasten all trim pieces and supports to existing concrete block with appropriate fasteners, Tapcon or similar.

E. For vertical applications, wall systems shall be mechanically fastened to horizontal metal furring strapping spaced 24 inches (610 mm) O.C. Furring straps shall be no less than 18-ga 3-1/2 inches (89 mm) wide, continuously. Metal strapping to be installed to the drywall studs prior to the application of the gypsum board by the framing contractor.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09 9113
EXTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Glass.
   6. Concealed pipes, ducts, and conduits.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 5000 - Metal Fabrications: Shop-primed items.

C. Section 09 9123 - Interior Painting.

1.4 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.5 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

G. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004).

H. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Fuller and D'Angelo, P.C. before preparing samples, to eliminate sheens not required.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data including product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five (5) years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three (3) years experience.

1.8 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide column & beam assembly illustrating paint color, texture, and finish.

C. Locate where directed by Owner's Representative.

D. Mock-up may remain as part of the work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.10 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer.

B. Paints:
1. Base Manufacturer: Sherwin-Williams Company; www.sherwin-williams.com.

C. Substitutions: See Section 01 2500 - Substitution Procedures

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.

1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Colors: Black.

2.3 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, unless otherwise indicated.

B. Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
2. Topcoat: Acrylic Latex applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 2.5 to 4.0
a. Sherwin Williams: Pro Industrial Acrylic.

C. Galvanized Metals, Alkyd, 3 Coat:
1. One coat galvanize primer.
2. Two coats of alkyd enamel:
a. Intermediate coat: Alkyd enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.6.
a) Sherwin Williams Direct To
b. Finish coat: Alkyd enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.6.
a) Sherwin Williams Direct To Metal Alkyd Enamel Semi-Gloss Pure White

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances by power wire brushing, power sanding, power grinding, power tool chipping and power tool descaling, using methods recommended in writing by paint manufacturer and SSPC-SP 3. Protect from corrosion until coated.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Steel door frames
   2. Plaster (Existing)
   3. Gypsum Board/Plaster walls, soffits, and ceilings.
   4. Exposed surfaces of steel lintels
   5. Mechanical and Electrical:
      a. In finished areas , paint conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
   6. Ceramic and other tiles.
   7. Acoustical materials, unless specifically indicated.
   8. Concealed pipes, ducts, and conduits.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 04 2000 - Unit Masonry.

C. Section 05 5000 - Metal Fabrications Shop-primed items.

D. Section 08 1113 - Hollow Metal Doors and Frames.

E. Section 09 2116 - Gypsum Board Assemblies.

1.4 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.5 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2017).

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

F. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004).

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Fuller and D'Angelo, P.C. before preparing samples, to eliminate sheens definitely not required.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's Representative's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color and type in addition to the manufacturer's label.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 10 years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience.

1.8 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide frame assembly illustrating paint color, texture, and finish.

C. Locate Where directed by the Construction Manager.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.10 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. Substitutions: Refer to Section 01 2500 - Substitution Procedures..

B. Paints:
   1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com.
   2. Primer Sealers: Same manufacturer as top coats.

C. Substitutions: 01 2500 - Substitution Procedures..

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   4. Supply each paint material in quantity required to complete entire project's work from a single production run.
   5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Fuller and D'Angelo, P.C. from the manufacturer's full line.

E. Colors: As indicated in Finish Schedule.
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.3 PAINT SYSTEMS - INTERIOR

A. Ferrous metals, Not Primed, Acrylic Latex, 3 coat:
   1. One Coat latex primer spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.6 mils.
      a. Sherwin Williams Direct-to-Metal Semi-Gloss.
   2. Topcoat: Three coats Acrylic Latex
      a. Sherwin Williams ProMar 400 Zero VOC Semi-Gloss

B. Ferrous metals, Primed, Acrylic Latex, 2 coat:
   1. Touch up with latex primer.

2. Two Coats Acrylic Latex spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet; 1.3 nils dry to 5.6 mils:
   a. Sherwin Williams ProMar 400 Zero VOC Semi-Gloss

C. Aluminum and Galvanized Metals, Not Primed, Acrylic Latex, 3 coat:
1. One Coat latex primer spreading rate recommended by manufacturer to achieve a film thickness of 5.0 to 10 mils wet; 1.8.to 3.6 mils dry..
   a. Sherwin Williams Pro-Cryl Universal Primer
2. Two Coats Acrylic Latex spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet; 1.3 nils dry to 5.6 mils:
   a. Sherwin Williams ProMar 400 Zero VOC Semi-Gloss

D. Gypsum Board/Plaster, Latex, 3 coat: (New Surfaces)
1. One Coat latex primer spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet and 1.3 mils dry.
   a. Sherwin Williams QUICK DRY Interior Exterior Stain Blocking Primer Latex
2. Topcoat: Two Coats of Acrylic Latex spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet; 1.3 nils dry to 5.6 mils
   a. Sherwin Williams ProMar 400 Zero VOC Semi-Gloss

E. Gypsum Board/Plaster, Latex, 2 coat: (Existing Surfaces)
1. One Coat latex primer spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet and 1.1 mils dry..
   a. Sherwin Williams QUICK DRY Interior Exterior Stain Blocking Primer Latex
2. Topcoat: One Coat of Latex spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet; 1.3 nils dry to 5.6 mils
   a. Sherwin Williams ProMar 400 Zero VOC Semi-Gloss

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Fuller and D'Angelo, P.C. of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Plaster and Stucco: 12 percent. (Existing)

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
   1. Prior to removing mildew, test any cleaner on a small, inconspicuous area prior to use.
   2. Bleach and bleaching type cleaners may damage or discolor existing paint films. Alternative cleaning solutions may be required
   3. Wear protective eye wear, waterproof gloves, and protective clothing.

F. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.

G. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

I. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and SSPC-SP 3. Protect from corrosion until coated.

J. Cleaning Existing Walls: Remove all loose paint, plaster and other coatings.
   1. Working from bottom to top, apply prepared cleaning solution to a dry surface.
   2. Leave solution on the surface for 5-20 minutes. If solution begins to dry, reapply.
   3. Gently scrub heavily soiled areas.
   4. Rinse thoroughly with clean water with by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip.
   5. Apply after wash. Let the Afterwash stay on the surface for three to five minutes.
   6. Pressure rinse from the bottom of the treated area to the top.

K. Metal Frames to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Provide new and replacement signage as indicated on drawings.

B. Emergency evacuation maps. (Correct floor plans will be provided by Owner's Representative). (Contractor shall fabricate and install).

1.3 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
2. Submit for approval by Owner's Representative and Fuller and D'Angelo, P.C. prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store tape adhesive at normal room temperature.

1.7 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Deterioration of metal or polymer finishes beyond normal weathering.
   b. Deterioration of embedded graphic image colors and sign lamination.
2. Warranty Period: 5 years years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PANEL SIGN

A. Manufacturers
   1. Flat Signs:
      a. Crown Signs, 4 Executive Plaza, Yonkers, NY 10701; (914) 375-2118.
   2. Substitutions: Section 01 2500 Substitution Procedures.

B. Manufacturer's standard monolithic tactile plaque constructed utilizing a thermoforming process, which provides a fully homogeneous plaque sign. The sign body, face, raised text and Braille are compression molded to form a single dimensional component that results in a sign surface that exhibits a toughness that resists scratching, cracking, gouging and graffiti.
   1. Style: Identification: Photopolymer Signs with raised lettering is physically attached, not laminated to the face plate.
      a. Sign to be satin Braille and pictograms raised. "Tipping" shall be provided where just the tips or the raised areas are finished providing an extra layer of protection to the sign and paint.
      b. Provide VHB Tape, holes drilled/countersunk for mounting, radius corners, and back plates and window areas for paper inserts where indicated.
   2. Material: Extruded Engineered PVC/Acrylic alloy with Integral background colors and high impact resistance with Class A Fire Rating.
   3. Frame: Plastic
      a. Thickness: 1/4 inch (3mm) or as shown on drawings.
      b. Edge Treatment:
         a) Standard 0.5" Radiused Corners.
      c. Color: As selected from manufacturer's standard colors.
   4. Lettering/ Tactile Characters/Symbols: Integral Raised 1/32 inch (1 mm) from sign plate face.
      a. Helvetica Med
   5. Lettering Style: Typeface as selected from the manufacturer's standard typefaces, upper case letters as indicated on drawings and match existing building signage.
   6. Braille: Grade 2 braille, placed as indicated on drawings
      a. Integral raised, painted to match background.
   7. Contrast: Letters, numbers and symbols shall contrast with background.
      a. Provide colors as shown on drawings.
   8. Color of Background: As selected from manufacturer's standard background colors to match.
   9. Color of Text and Raised Characters: As selected from standard colors to match existing.
   10. Surface Texture: Matte

2.2 MATERIALS

A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
   1. Plastic (self-extinguishing material) engraving stock with face and core piles in contrasting colors, in finishes and color combinations indicated or, if not indicated, as selected from the manufacturer's standard.
   2. 2.125" thick non glare acrylic with square edge.

2.3 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
   1. Flame Spread: Less than 25.
   2. Smoke Development: Less than 450

B. Provide for locations and rooms as scheduled and shown on drawing.

C. Emergency Evacuation Maps:
   1. Plan and evacuation rates will be provided by the Owner's Representative.
   2. Fabricate and install as indicated on drawings.
   3. Second surface direct print on non-glare clear acrylic, back painted.
   4. All text/graphics/map direct subsurface printed.
      a. Background color: White.
      b. Map color and text: Black.
      c. Graphics: Red.
   5. Artwork shall be generated by the signage manufacturer.
   6. Attachment: wall mounted with foam tape.
   7. Total thickness: 1/8 inch (3mm).
   8. Frame: similar to paragraph (2.1) (B) (3).
   9. Location: Where shown on drawings.

2.4 ACCESSORIES

A. Concealed Screws: Security type Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. All signs to be mechanically fastened and taped.

C. Install neatly, with horizontal edges level.

D. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.3 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 09 2116 - Gypsum Board Assemblies.

1.4 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.5 PERFORMANCE REQUIREMENTS

A. Conform to NFPA 10.

B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.7 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:
   1. Larsens's Manufacturing Co., 7421 Commerce Ln, Minneapolis, MN 55432, (800) 527-7367.
   2. Substitutions: Section 01 2500 Substitution Procedures.

B. Fire Extinguisher Cabinets and Accessories:
   1. Larsen's Manufacturing Co; -: www.larsensmfg.com.
   2. Substitutions: Section 01 2500 Substitution Procedures.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.2 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

C. Metal: Formed galvanized steel sheet; 0.036 inch thick base metal.

D. Cabinet Configuration: Semi-recessed.
   1. Size to accommodate fire extinguishers and accessories.
   2. Trim: Flat rolled edge, with 1/2 inch wide face.

E. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

F. Door Glazing: Plastic, clear, 1/8 inch thick acrylic bubble. Set in resilient channel gasket glazing.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

H. Fabrication: Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

J. Finish of Cabinet Interior: White colored enamel.

2.3 ACCESSORIES

A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

B. Cabinet Signage: "FIRE EXTINGUISHER".

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, as indicated on drawings from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets and on wall brackets.

3.3 SCHEDULES

A. Fire Extinguishers
   1. Model MP10
      a. Capacity: 10 lbs
      b. Weight: 18 lbs
      c. Cylinder Diameter: 5”
      d. Height: 20”
      e. Width: 7-3/4”
      f. UL rating: 4A-80B: C
      g. Standard Bracket: 5525
      h. Location: Refer to floor plan.
   2. Model DC10
      a. Capacity: 20 lbs.
      b. Weight: 38 lbs
      c. Cylinder Diameter: 7”

d. Height: 23-1/4”
e. Width: 7-3/4”
f. UL rating: 2A-C
g. Standard Bracket: 5525
h. Location: Mechanical and electrical rooms.

B. Fire Extinguisher Cabinets.
1. Larson's Cameo Series FS C2409-SM surface mount design suitable for fire extinguishers specified.
2. Trim: 5/16"
3. Acrylic Bubble.
4. Finish: Stainless Steel #4 satin finish.
5. Construction: High impact plastic.

END OF SECTION

RAYMOND/RAYMOND ASSOCIATES
SECTION 11 40 00 - FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section shall conform to the requirements of the Contract Documents including drawings and general provisions of the Contract, General and Supplementary Conditions and Division 01 Specification Sections.

1.2 BIDS

A. Unless otherwise noted, Kitchen Equipment Contractor (KEC) is a sub-contractor to the General Contractor (GC) and is to provide and install all items listed in this section and as detailed on food service drawings.

B. All Prime Contractors shall review the Food Service Drawings, FS.1 thru FS.9 and are responsible for all work items called out as being by their specific trade (ie: electrical, plumbing, mechanical, general, etc.) All kitchen equipment shall be provided and installation shall be part of the Prime Contract for General Construction (GC). Additionally, all references to the Kitchen Equipment Contractor (KEC) in the Food Service Drawings or Specifications is referencing work that is to be performed by a subcontractor to the Prime Contract for General Construction (GC). The Kitchen Equipment Installer will not be making final connections, all final connections of equipment shall be by the Prime Contracts under this project (MC, PC, EC). All Prime Contractors are responsible for coordination with one another and with the Kitchen Equipment Contractor under the GC Prime Contract.

C. Raymond/ Raymond Associates is herein identified as the Food Service Consultant.

D. Bids must be based on equipment of manufacturers specified; no substitution will be accepted after award of Contract.

E. Substitutions: When a product or material is specified by name and or model number, as noted in these specifications, such specifications establishes the standard type and quality considered most satisfactory for the particular purpose in the building. The bid proposal therefore should be based thereon, so that all bidders bid under the same conditions. Another product or material of the same type that meets the requirements may be submitted for consideration as a substitute only under the following conditions:

1. In providing substitution requests, the bidder must prove equivalence of the substitution and furnish detailed specifications and catalog cuts or drawings. Failure to identify exceptions or deviations from equipment specified must be interpreted to indicate that the product offered complies with the specification in every respect.

F. Custom fabrication, millwork, equipment, etc. must be built by a company continually in business for at least a 5-year period.

G. Contract documents convey a method of construction for custom fabrication; however this may or may not be the appropriate method based on selected fabricators industry knowledge and standards. It will be the responsibility of the selected fabricator to interpret and apply appropriate methods of construction for full functionality of custom fabrication.

1.3 WORK INCLUDED

A. KEC shall coordinate with other trades or sub-contractors in order that whole installation may result in the highest grade possible.

B. KEC shall provide and install only such valves, traps, faucets, shut-offs, reducing pressure valves, relief valves and other specialty items required within equipment and as hereinafter specified.

C. KEC shall make all necessary cut-outs and knock-outs where required on equipment to accommodate electrical receptacles, switches or other electrical outlets and equipment, together with such cut-outs as required for passage of gas or plumbing piping, etc.

D. KEC shall stack and remove rubbish waste material, crating, etc., resulting from work and keep the premises clean at all times. Upon completion of the installation, thoroughly and finally clean all equipment ready for use.

1.4 POWER AVAILABLE

A. Electric Voltage: 120/208/480 volt, 60 cycle, 1 & 3 ph.

B. Water Pressure: Typical Food Service Equipment range 25 to 90 PSI, if required, pressure reducing valves provided by Plumbing Contractor.

C. Water Temperature(s):

1. 110°-120° Fahrenheit max at hand washing sinks, work sinks and preparation sinks.
2. 120°-140° Fahrenheit max at 3-compartment pot sink, dishwashers and hose reel assembly.
3. 110°-120° Fahrenheit max at cooking equipment with faucet assembly.

1.5 GENERAL CHARACTERISTICS OF EQUIPMENT

A. Electrically Operated

1. Electrically operated equipment to be listed by Underwriters Labs., Inc.
2. Motors: Up to and including 3/4 horsepower, shall be 120/60/1.
3. Motors: Over 3/4 horsepower, 208/60/3, unless otherwise indicated.
4. Ranges, food warmers, etc., over 2.0 kW, 208/60/1 or 208/60/3, unless otherwise indicated.
5. Electrically heated equipment, etc., 2.0 kW and under, 120/60/1.
6. 1 ph. electrical plug-in units with 3 wire cords; 3 wire cap.
7. 3 ph. electrical plug-in units with 4 wire cords; 4 wire cap.
8. Motor driven equipment: equipped with starting switch.
9. Motors: equipped with overload protection.
10. Wiring on fixtures, including operating switches and pilots, furnished by Kitchen Equipment Contractor.

B. Submit in writing to Architect and Food Service Consultant for approval, schedule showing proposed electrical characteristics of each piece of equipment and disconnect means provided.

C. Punch holes for, and install hood and walk-in cooler/freezer lights and concealed conduits. The interconnection of same, including control switch, wiring, inter-wiring between sections, etc., by Electrical Contractor.

1.6 WORK EXCLUDED FROM THIS DIVISION

A. The following work is to be performed by other trades or sub-contractors and is not the responsibility of the Kitchen Equipment Contractor. The GC is responsible to hire all necessary sub-contractors.

1. Electrical Contractor
   a. Make connections to all food service equipment as shown.
   b. Furnish disconnect switches.
   c. Interconnecting of all exhaust hood lights, switches, control packages, interfaces, etc. including inter-wiring between sections of exhaust hoods.
   d. Interconnecting of control switches as required on equipment shown, and all other components which come as part of any equipment shown on plan.
   e. Interconnecting of any equipment, including, but not limited to, walk-in coolers/ freezers monitoring, exhaust hood monitoring and/ or fire protection monitoring with building management systems.
   f. Review all manufacturer approved installation methods/ diagrams and comply for proper installation of equipment being furnished.
2. Plumbing Contractor
   a. Make hot and cold water, waste and gas connections to all kitchen equipment shown, furnishing all necessary shut-offs, traps, backflow preventers, vacuum breakers, grease traps, drain line runs, etc.
   b. Install all faucets, pot fillers, filters and pressure regulators as furnished by Kitchen Equipment Contractor.
   c. Interconnecting of any and all other components that come as part of any other equipment shown.

d. Provide floor drains and floor sinks where shown and indirect piping to floor drains and floor sinks as indicated on drawings.
e. Review all manufacturer approved installation methods/ diagrams and comply for proper installation of equipment being furnished.

3. Ventilation Contractor
   a. Furnish size, shape and location of vent collars for exhaust hood and make connections to these collars.
4. General Contractor
   a. Provide and/or coordinate all work to the floors, walls and ceilings of the space.
   b. Provide wall blocking where required and as indicated on food service drawings.

1.7 SUB-CONTRACTORS TO KITCHEN EQUIPMENT CONTRACTOR

A. Fire Protection Contractor for the wet chemical protection system within exhaust hood systems only and Refrigeration Contractor for the remote refrigeration packages for walk-in coolers/ freezers, rack systems, etc. are typical sub-contractors to the Kitchen Equipment Contractor.

B. KEC to provide the name and addresses of all sub-contractors furnished to Architect/Owner and Food Service Consultant at time of submitting shop drawings. Selection of sub-contractors must be approved by them; and if in their judgment any fail to prosecute work in strict accordance with drawings and contract, after due notice from Owner or his agent, shall discharge same, but this in no way releases Kitchen Equipment Contractor from his obligations and responsibility under the contract.

C. Every sub-contractor bound by terms and provisions of the contract so far as applicable to his work. Nothing contained herein shall create any contractual relations between any sub-contractor and Owner.

D. Kitchen Equipment Contractor fully responsible to Owner for acts and omissions of his/ her sub-contractors.

1.8 SHOP DRAWINGS, ETC.

A. Immediately upon award of Contract and within 4 weeks, submit to Architect/Owner and Food Service Consultant, drawings for approval. Submit 1/4" scale rough-in drawings showing locations of plumbing and electrical connections with all requirements indicated at point of connection; use of a legend or numbered connection plan will be cause for drawing rejection. Prior to fabrication, submit to Architect for approval 1/2" scale shop drawings showing plan, elevations and isometric views covering all items of work. Drawings to show dimensions and details of construction, installation and relations to adjoining and related work where same requires cutting or close fitting. Show reinforcement, anchorage, etc., required for complete installation. After correction and approval of above, submit sets for record, then afterwards as many additional copies as required by client.

B. Submit in same manner as above, drawings showing masonry bases, depressed floors, positions of walls, requirements for ceiling hangers, wall blocking, and any other special conditions necessary for complete and correct correlation of various trades for satisfactory installation of all equipment shown on drawings.

C. Manufacturer's names, cuts, descriptive data, analysis of tests, rated capacities and other information necessary for approval of standard manufactured articles and equipment furnished to Architect/Owner and Food Service Consultant for approval before ordering or purchasing. This submission made in same manner as above. All cuts marked with item number, mechanical characteristics, accessories furnished and bound in folders.

1.9 GENERAL

A. No machine or equipment acceptable from any manufacturer not having had equipment of approximately the same type and design as that specified operating successfully for at least 5 years. Machines installed for test purposes shall not come within the category of successful commercial operation.

B. Architect/Owner and/or Food Service Consultant privileged to inspect material and fabrication at Kitchen Equipment Contractor's or its sub-contractors factory at any time.

C. Before proceeding with shop work, Kitchen Equipment Contractor to verify all measurements at premises. Where required dimensions are not immediately obtainable and delay in waiting for these dimensions would cause work to

be seriously delayed, the matter shall be referred to Architect for a decision. In obtaining measurements, Kitchen Equipment Contractor shall consider work requirements of other trades and equipment designed and fabricated to provide necessary clearance for surrounding and adjoining work.

D. Kitchen Equipment Contractor responsible for making any and all necessary adjustments to complete his work in a workmanlike manner, as approved by Architect/Owner.

E. Dimensions as indicated on drawings and specifications are approximate, and are to be adjusted if and where necessary to suit job conditions and field measurements.

F. Tops of tables, shelves, tops and exterior panels of cabinets, counters, doors, drainboards, etc., to be constructed of a single sheet of metal. Where size of equipment requires more than 1 sheet of metal, sheets butt joined with joints continuously welded full length. No joints less than 18" from an edge or end of a piece of equipment. In addition, all joints shall have battens or stiffeners welded to jointed material, ground smooth and polished.

G. Appliances of rigid construction free from objectionable vibration and quiet in operation.

H. Electrical heating elements shall conform to latest standards of National Electrical Manufacturer's Association and Underwriters Labs., Inc., where applicable standards have been set up by such agencies.

I. Motors of ample power to operate machines for which designated under full load operating conditions without exceeding nameplate ratings. Horsepower requirements on driven equipment determined by manufacturer, based on normal operation of maximum capacity.

J. Motors drip-proof, splash-proof or totally enclosed type, having two-hour duty cycle and ball bearings (except small timing motors which may have sleeve bearings). All motors shall have windings impregnated to resist moisture. Motors located where adjacent to deposits of dust, lint, etc., totally enclosed type.

K. It is the responsibility of the Kitchen Equipment Contractor to supply and mount all electrical outlets, switches, controls, etc. within table/counter back splashes, aprons, panels, etc. and to provide stainless steel cover plates as required. Furthermore, it is the responsibility of the Electrical Contractor, in coordination with the Kitchen Equipment Contractor, to make final interconnections within table/counter interior to junction boxes, outlets, switches, controls, etc. for equipment indicated.

1.10 STAINLESS STEEL (S.S.)

A. Where S.S. is specified, it shall be Type 304, nickel bearing iron alloy, containing approximately 17.0% to 19% chromium, 8% to 10% nickel, not more than 0.2% carbon, and not more than 2.0% of other alloying elements; designed being austenitic (non-magnetic).

B. S.S. free from scale with all surfaces polished to a high commercial finish. All welding and exposed welds hereinafter specified, must be ground down and polished smooth to a #4 finish so that no evidence of welding will appear. Unexposed welds on underside of counter or tables ground smooth and treated with an acid solution to remove weld discoloration and oxidization and to arrest corrosion.

C. Undersides of all counters, work tables, sinks, drain boards, etc., after fabrication, to have one (1) heavy coat of sound deadening material applied as allowed by local codes.

D. Gauges for sheet iron and sheet metal, U.S. Standard.

E. Rivets, welds, bolts, screws, nuts and washers to be steel except where brass or S.S. is fastened, in which case they shall be brass or S.S., respectively. Where dissimilar metals are fastened, welds, bolts, rivets, screws, nuts and washers, highest grade metal. Spacing and extent of welds, rivets, bolts and screws such as to insure suitable fastening and prevent bulging of metals fastened.

1.11 SANITATION

A. All custom built equipment constructed in accordance with standard No. 2, 4 & 7 of National Sanitation Foundation Testing Laboratory, manufactured by a company approved by N.S.F. and carry their stamp of approval. Kitchen Equipment Contractor must have "Registered" numbered seal of N.S.F. approval.

1.12 OPERATING INSTRUCTIONS

A. Kitchen Equipment Contractor shall leave all items of equipment in good, operating condition and furnish the services of a "qualified" competent manufacturer's representative to instruct Owner's employees in proper use and care of equipment. Representative on call for as long a period as is necessary to assure Owner that such instruction is thoroughly understood.

B. Kitchen Equipment Contractor shall be responsible for scheduling of equipment demonstrations and/or training and shall provide a detailed list of expected dates, times and manufacturer's representative to be present (in attendance) for each piece of equipment.

C. Kitchen Equipment Contractor or his qualified manufacturer's representative, thereafter, shall make all necessary calls during warranty period.

1.13 SAMPLES

A. After Award of Contract, when requested, Kitchen Equipment Contractor shall supply Architect with samples of fabricated equipment, such as corner of table with a rolled or inverted "V" edge, corner of dish table, overshelf, drawer assembly, table leg with foot and gusset, or as specifically requested.

1.14 GUARANTEE

A. Kitchen Equipment Contractor shall guarantee, as part of the bid and/or contract, workmanship, material and equipment for a period of 2 years from date of equipment final install and project turnover to Owner, and shall remedy any defect due to faulty workmanship or materials which may appear within guarantee period.

B. Manufacturer's operation and maintenance manuals on equipment, etc., turned over to the Owner in duplicate, bound in a folder and marked accordingly.

1.15 EQUIPMENT CONSTRUCTION AND STANDARDS

A. Where initials S.S. are used, they refer to "stainless steel;" C.P. refers to "chrome plated;" N.I.C. refers to "not in contract;" G.I. refers to "galvanized iron;" F.D. refers to "floor drain", and F.S. refers to "floor sink."

1.16 WASTES AND OVERFLOWS

A. Sinks to have the following waste and overflow assemblies:

1. For 1-1/2" NPT: Fisher model 74043 or approved alternate. Lever handle waste outlet with overflow assembly, 3-1/2" sink opening, self-centering stainless steel face flange with flat strainer, 12 gpm max flow rate, stainless steel lever handle with ball, overflow head with stainless steel faceplate and chrome plated cast red brass drain body.
2. For 2" NPT: Fisher model 74043 or approved alternate. Lever handle waste outlet with overflow assembly, 3-1/2" sink opening, self-centering stainless steel face flange with flat strainer, 12 gpm max flow rate, stainless steel lever handle with ball, overflow head with stainless steel faceplate and chrome plated cast red brass drain body.

1.17 WATER INLET LOCATION

A. Located in all cases above the positive water level to prevent siphoning of liquid into water system. Wherever conditions require water inlet below such level, a suitable type of vacuum breaker shall be placed on fixture and form part of same to prevent such siphoning.

B. All faucets furnished by Kitchen Equipment Contractor as specified. Traps furnished by Plumbing Contractor.

1.18 PITCH AND DRAINAGE

A. Wherever a fixture is used with waste or drain outlet, surface shall have distinct pitch towards outlet. Drainboards and tables that contain or adjoin sinks shall have a definite pitch towards sinks. Where necessary, surfaces creased and grooved to give a definite pitch.

1.19 SINKS

A. #14 gauge S.S. interior corners rounded to 1" radius horizontally and vertically, forming a cove in bottom. All joints butt edged. Sink sizes given, inside measurements.

B. Bottom of each compartment creased to center and fitted with a rotary drain as described in section 1.16, hereinbefore specified. Waste lever not to protrude beyond body of sink. Sinks to have overflows installed by Kitchen Equipment Contractor.

C. Overflow to consist of 1-1/2" chrome plated brass strainer plate, fitted in back of each compartment at proper level directly connected to waste outlet with 1-1/2" chrome plated brass pipe.

D. Back of sink extended integrally approximately 12" above working level, back 2-1/4" on 45° angle towards rear and then flanged down 1" and punched to accommodate faucets.

E. Front and both ends, unless otherwise specified and shown, finished on top edge, 3" above working level, with 1-1/2" diameter, 180° welded integral roll. Exterior corners rounded to a 2-1/2" radius, all integrally welded.

F. Sinks and drainboards finished on front and back edges only and left with straight edge on ends, so that drainboards may be welded thereto, forming integral units with top edge of rolled rim curbing formed on one horizontal plane across front to unit though surfaces of drainboards pitched to sinks.

G. Multiple compartment sinks divided with double wall #14 gauge S.S. partitions, all corners rounded same as corners in sinks, continuously welded in place.

H. Back, bottom and front of one continuous piece with no overlapping joints or open spaces between compartments.

1.20 SINK BOWL BUILT INTO TABLE TOP

A. Sink constructed integral with table top #14 gauge S.S. having all interior corners coved vertically and horizontally forming a cove in bottom. To have overflow, lever waste outlet, etc…, as hereinbefore specified for sinks in spec section 1.19.

B. All joints butt edged and welded, ground and polished, so that no evidence of welding will appear. All sink sizes inside measurements. Table top where shown, punched to receive deck type combination faucets, provided by Kitchen Equipment Contractor.

1.21 FAUCET AND BASKET DRAIN ASSEMBLY

A. Sinks to have the following faucet assemblies:

1. 3-Compartment Sink, Potwash:
   a. 1 ea. Fisher model 74306 or approved alternate. Pre-Rinse assembly with 1.3 gpm flow rate or less, splash/ wall mount, 8" centers, add-on faucet 12" stainless steel tubular swing spout with 4" wrist blade handles, 36" flexible gooseneck hose with spray head, stainless steel spring with wall bracket, compression valves, 1/2" NPT female inlets, ADA compliant, NO LEAD and NSF approved. Deck mount assembly model 75485.
   b. 1 ea. Fisher model 60798 or approved alternate. Faucet with 2.2 gpm flow rate or less, splash/ wall mount with 4" wrist blade handles, 8" centers, 12" stainless steel tubular swing spout, compression valves, 1/2" NPT female inlets, ADA compliant, NO LEAD and NSF approved. Deck mount assembly model 57665.
2. 2-Compartment Sink, Preparation:
   a. 1 ea. Fisher model 57665 or approved alternate. Faucet with 2.2 gpm flow rate or less, deck mount with 4" wrist blade handles, 8" centers, 12" stainless steel tubular swing spout, compression valves, 1/2"

NPT female inlets, ADA compliant, NO LEAD and NSF approved. Splash/ wall mount assembly model 60798.

3. Work Sink (Built-in, Welded-In):
   a. 1 ea. Fisher model 57665 or approved alternate. Faucet with 2.2 gpm flow rate or less, deck mount with 4" wrist blade handles, 8" centers, 12" stainless steel tubular swing spout, compression valves, 1/2" NPT female inlets, ADA compliant, NO LEAD and NSF approved. Splash/ wall mount assembly model 60798.
4. Hand Sink:
   a. 1 ea. Fisher model 58696 or approved alternate. Faucet with 2.2 gpm flow rate or less, deck mount with 4" wrist blade handles, 4" centers, 6" stainless steel swivel gooseneck spout, compression valves, 1/2" NPT female inlets, ADA compliant, NO LEAD and NSF approved. Splash/ wall mount assembly model 62650.

B. All plumbing fixtures shall be certified CSA, ASME A112.18.1/CSA B125.1, AB1953/HSC 116875, Vermont Bill S152, NSF/ANSI 61 sec 9, annex F and G, NSF/ANSI 372 low lead content, ASTM F2324.

1.22 DRAINBOARDS

A. #14 gauge S.S. full width of sink carried up approximately 12" at back and where adjacent to wall and finished same as heretofore described for back of sink, and having 3" high curbing at front and ends not adjacent to walls and finished with integral 1-1/2" diameter 180° roll, unless otherwise specified.

B. Drainboards continuously welded to sinks.

C. Drainboards 30" long or less shall have 1-1/2" #16 gauge S.S. tubular braces secured at underside near front and welded to S.S. gusset at leg anchor. All others to have legs and cross bracing with full length and width undershelf as specified for tables.

1.23 TABLES WITH S.S. TOPS

A. Tops of #14 gauge S.S. 1 piece construction with all edges turned down into 2" integral 180° roll with all corners rounded to 2" radius forming a bullnosed corner. Corner welded and polished smooth.

B. Table tops thoroughly cross braced with 4" x 1" S.S. channel stiffeners #14 gauge welded to underside. All cross braces spaced not over 24" on center.

C. Table tops adjoining walls or adjacent equipment carried up approximately 6" and returned 1", down 1" at top and ends. Intersections of table top and raised edge coved to 1" radius. Where backsplash is exposed, it shall have finished S.S. back.

D. It is the responsibility of the K.E.C. to supply and mount all electrical outlets, switches, controls, etc. within table/counter back splashes, aprons, panels, etc. and to provide S.S. cover plates as required. Furthermore, it is the responsibility of the Electrical Contractor, in coordination with the Kitchen Equipment Contractor, to make final interconnections within table/counter interior to junction boxes, outlets, switches, controls, etc. for equipment indicated, if required.

1.24 NOT USED

1.25 NOT USED

1.26 NOT USED

1.27 NOT USED

1.28 NOT USED

1.29 NOT USED

1.30 NOT USED

1.31 NOT USED

1.32 NOT USED

1.33 NOT USED

1.34 NOT USED

1.35 NOT USED

1.36 NOT USED

1.37 NOT USED

1.38 NOT USED

1.39 SERVING COUNTER

A. Of size and shape as shown. Top of #14 gauge polished S.S. rolled down in a 2" diameter 180° roll on all exposed edges with corners bullnosed, welded. Top secured to counter base by means of concealed S.S. studs, nuts and washers. Angle frame under top sheathed with sound deadening material.

B. Base constructed with interior framing of 1-1/2" x 1 1/2" x 1/8" galvanized steel angle with all joints welded.

C. Angle framework concealed on the interior with #18 gauge polished S.S. sheathing. Exterior facing of base cabinet and ends to have sheathing of Plastic Laminate paneling laminated to 3/4" thick solid core, exterior grade marine plywood, panel length not to exceed 36". Color and style of paneling selected by Architect. Each panel of length as indicated, full height of counter and splined hairline joints. Panels and trim secured to interior framing by means of concealed welded studs, nuts and washers. Or constructed of alternate materials as detailed on drawings.

D. Interior of all available space provided with bottom and intermediate shelf of #16 gauge S.S. turned up approximately 2" at rear and ends, and down 1-1/2", and in 1/2" channel shape at front.

E. Mounted on masonry base, height as indicated on drawings or 6" high 14 gauge S.S. legs with S.S. removable toe base, where indicated. All openings in top flanged downward approximately 1" around their entire perimeter. Top cut out for and provided with equipment as hereafter specified.

F. It is the responsibility of the K.E.C. to supply and mount all electrical outlets, switches, controls, etc. within table/counter back splashes, aprons, panels, etc. and to provide S.S. cover plates as required. Furthermore, it is the responsibility of the Electrical Contractor, in coordination with the Kitchen Equipment Contractor, to make final interconnections within serving counter interior to junction boxes, outlets, switches, controls, etc. for equipment indicated, if required.

1.40 NOT USED

1.41 HOT FOOD SECTION

A. Top #14 gauge polished S.S. integral and continuous with counter and top, provided with 12" x 20" openings as shown.

B. Each opening to have #14 gauge S.S. well measuring approximately 6-1/2" deep. Where top is flanged down into well, fitted with a breaker strip on 4 sides of opening. When and where food wells are used with drains, all drains are to be interpiped with 1-1/2" C.P. or S.S. piping by Kitchen Equipment Contractor, and extended to common point near floor drain for Plumbing Contractor to make indirect waste connections. Kitchen Equipment Contractor to furnish and install C.P. or S.S. shut-off valve extending for easy access.

C. Each well heated as hereinafter specified, dry-moist type electric heater with individual thermostatic control and pilot light. Thermostat dials and pilot lights attached on attendant's side recessed into a panel installed inside of plate shelf areas or apron mounted as shown. All electric food wells connected to a common heavy toggle switch. Wiring concealed.

D. Food wells to have bottom of housing fitted with sectional removable #16 gauge G.I. bottoms for access to wiring and elements. Counter base under hot food section to be lined with #18 gauge S.S.

E. Each hot food section provided with the following #20 gauge Polar Ware Classic Anti-Jam inserts and covers: two S12104 pans with two 1/2 size lift-off covers and provide one dome-type 12" x 20" lift-off cover for each opening; two S12106 pans, three S12066 pans, four S20124 pans; four S12102 pans, four S20122 pans.

1.42 COLD PAN

A. Of size and shape shown, approximately 20" wide, of length as shown on plan, 6" deep in the clear, unless otherwise indicated, constructed in accordance with NSF #7, integrally constructed into counter and top. To have sectional #18 gauge S.S. perforated false bottom in sections not over 18" wide, 1/2" channel edge on 4 sides. Interior lining to have all corners rounded to 1" radius vertically and horizontally, of #14 gauge S.S. all joints and crevices welded. Where cold pan is used as a salad bar, same to be 8" deep in the clear unless otherwise indicated.

B. Insulation in all 4 sides and bottom of unit 2" thick polyurethane or equal. Refrigeration coils copper 1/2" O.D. and 3" on center, sweated to underside and embedded in insulation. Provide a copper tubular refrigeration coil, further sealed with hydrolene. Coils connected to compressor hereinafter specified, and shall have liquid line with solenoid valve and thermostat for control, provide a shut-off valve in liquid line ready and accessible to disengage same when required.

C. Exterior sheathing of #18 gauge S.S. bottom pitched and fitted with a 1-1/2" drain outlet with threaded connection plumbing. Plumbing Contractor to extend drain line so as to flow into adjacent floor drain. Joint between top of cold pan and turned down edge of counter top provided with breaker strip around full perimeter of opening.

D. Where shown, space under counter provided for installation of compressor. This section fitted with removable #18 gauge S.S. grill on attendant's side. Shall have not less than 75% rectangular perforation. Counter front panel and/or sides where possible in way of compressor housing louvered. Interior of housing reinforced with horizontal and vertical framework of 1 1/2" x 1-1/2" x 1/8" angle having all joints welded. Lower frame provided with #14 gauge channel stiffeners welded in place and fitted with rubber cushions. Channel spaced to properly support condensing unit. Housing approximately 24" left to right to properly admit compressors.

E. Refrigeration coils connected to condensing unit, size as indicated on plan, air cooled, furnished complete with all necessary copper tubing, thermostatic control valves dehydrators, expansion valves, sight glass, etc., to make a complete working unit with warranty and free service, guarantee for 1 year. Compressor connected to coils of cold pan in a satisfactory and operating manner. Compressor, etc., internally wired. Provide push button switch with pilot lite recessed in adjacent section in apron above housing to turn on/off cold pan as required.

1.43 NOT USED

1.44 TRAY SLIDE

A. Of size and shape, as hereinafter specified and/or shown on contract drawings. Installed where shown, 12" wide, #14 gauge S.S. construction or in strict accordance to that as detailed on drawings.

B. In general, unit mounted on #12 gauge S.S. ornamental type brackets secured to front trim of counter in a concealed manner with welded concealed studs. Back edge of turned up section made to fit tight with turned down front section of counter top and definitely free of voids, cracks and unsanitary joints.

1.45 NOT USED

1.46 COUNTER AND CABINETS WITH SLIDING DOORS

A. Tops #14 gauge polished S.S. with outer edges turned down vertically and integrally 2" then in 1-1/2" forming a channel edge on both exposed sides. Where adjacent to wall, top carried up approximately 6" or "as specified" and returned 1" at top and ends toward wall as hereinbefore specified for tables against walls, corners welded forming continuous unit. Tops fastened to cabinets by welded and concealed studs.

B. Cabinets below tops constructed of #18 gauge polished S.S. with all joints and crevices welded. Tops of cabinets reinforced with a horizontal frame of 1-1/2" x 1-1/2" x 1/8" angle with cross braces on 18" centers. Framework of all welded construction. Bottom and intermediate shelves constructed of #16 gauge S.S. with 4" x 1" #16 gauge S.S. channel stiffeners not over 24" on center.

C. Unit, unless otherwise specified and shown, mounted on 6" #14 gauge S.S. legs with adjustable bullet feet.

1.47 NOT USED

1.48 NOT USED

1.49 DOORS

A. Whether sliding or hinged type, not less than 1/2" thick overall, double paneled having 3/8" sound-deadening material between #16 gauge S.S. front and #18 gauge S.S. back, reinforced between panels by wide channels, running height of door and made of same material. Panels jointed with continuous welding. Doors and vent openings to have back panel boxed around vent opening and welded to front panel. Doors dust proof and entire front face without seams or joints.

B. Sliding doors mounted on ball bearing type rollers, sliding in dust proof #14 gauge S.S. tracks overhead, fastened so as to eliminate vibration and jarring when doors are rolled. Doors fitted with limit stops. Bottom guide of #14 gauge S.S. for doors, open and flat, lining up with lower shelf of cabinet - slots so arranged that crumbs or dirt accumulating in the cabinet will drop to the floor when cabinet is cleaned. Recessed handles solid material, not stamped, of S.S. welded to front panel. Finger grips of ample depth to comfortably pull the door. Doors provided with keyed-alike S.S. faced cylinder locks, built-in flush.

C. Hinged type doors flush fitting, unless otherwise specified, resting tightly against rabbetted frame. Hinged doors provided with Klein Model #Y-48 (or approved equal) keyed-alike S.S. faced cylinder locks with Model #12230-SM (or approved equal) handles. In case of pair of doors, each individually controlled as outlined and is to close against rubber bumpers.

D. Outer edges smooth, free from burrs, projections and fins. Excess welded metal removed by precision grinding and polishing.

1.50 REFRIGERATORS AND REFRIGERATION UNITS

A. Reach-in refrigerators, freezers, and refrigerated units, as shown unless otherwise specified, furnished by Kitchen Equipment Contractor They shall meet all requirements as set forth for individual item number and complete with self-contained or remote compressors and motors. Cooling coils blower type, unless otherwise called for, provided with initial charge of approved CFC free refrigerant. Plumbing Contractor responsible for extending refrigerator drain line, where required, to spill into adjacent floor drain in approved manner. Extended drain line not less than 3/4" I.D. and C.P. or S.S. tubing.

B. All refrigerated equipment, refrigerators and freezers, whether walk-in or reach-in, started and adjusted to maintain required temperatures, charged with approved refrigerant as required.

C. All reach-in refrigerators, freezers, hot food warmers, etc., to have keyed-alike locks. Kitchen Equipment Contractor must request this at time of placing order to avoid correction at a later date at Kitchen Equipment Contractor's expense.

D. Kitchen Equipment Contractor to provide 1 year's free service for all types of refrigerators and refrigeration equipment. Service to include all compressors, unit coolers, controls, etc., to include adjustments and repairs, irrespective of cause, whether mechanical, operational or manufacturing at no additional cost to Owner. Additionally, five (5) year warranty provided on all compressors, parts only or replacement.

1.51 NOT USED

1.52 NOT USED

PART 2 - PRODUCTS

GREENVILLE ELEMENTARY SCHOOL

ITEM #1 HAND SINK, WALL MNTD. – QTY. AS PER PLAN & SCHEDULE

Eagle Group/Metal Masters Model HSA-10-FDPS. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- 1 ea. Electronic faucet, gooseneck
- 1 ea. Soap dispenser
- 1 ea. Towel dispenser
- 1 ea. Left and right splash guards
- Wall backing by General Contractor

Or as manufactured by Aero Mfg. or IMC/ Teddy.

ITEM #2 3-COMPARTMENT SINK – QTY. AS PER PLAN & SCHEDULE

Eagle Group/Metal Masters Model FN2060-3-18-14/3. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- 3 ea. Built-in work sinks, 20" L x 20" W x 14" D
- 3 ea. Waste valve with lever, Fisher Mfg. model DrainKing
- 3 ea. Tail piece, Fisher Mfg. model 6129
- 3 ea. Waste overflow, Fisher Mfg.
- 1 ea. Stainless steel pre-rinse assembly with 12" swing spout add-on faucet and wrist action handles, 1/2" connections
- 1 ea. Stainless steel faucet with 12" swing spout and wrist action handles, 1/2" connections
- Flanged feet bolted to floor

Or as manufactured by Aero Mfg. or IMC/ Teddy.

ITEM #3 STORAGE SYSTEM, WALL MNTD. – QTY. AS PER PLAN & SCHEDULE

Eagle Group/Metal Masters Model WAL-STOR. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Mounting Height: 50" above finished floor
- 2 ea. Wall grid/mat, WM1848-E, stacked
- 1 ea. Wall uprights, vertical, PR45VU-E
- 2 ea. Shelf, 1448-E
- 2 ea. Shelf Brackets, PR14B-E
- 1 ea. Grid Shelf, 1436WGS-E
- 2 ea. Baskets, WB-E

- 12 ea. Utility Hooks, UH-E
- 1 ea. Epoxy coated finish, entire wall system
- Wall backing by General Contractor

Or as manufactured by Focus or Metro.

ITEM #4 STORAGE SHELVING, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Metro Model MQ2160G. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Shelving to be sized to fit
- 5 ea. 21" x 60" Shelves with removable, vented inserts
- 4 ea. 74" High uprights
- 1 ea. Tool free shelf adjustment
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Eagle Group/Metal Masters or Cambro.

ITEM #5 CABINET, MOBILE, WARM/ HOLD – QTY. AS PER PLAN & SCHEDULE

Cres Cor Model H-137-SUA-12D-SD. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Capacity: (12) 18" x 26" Pans or (24) 12" x 20" Pans
- Verify door hinging
- 1 ea. LED digital display
- 1 ea. High impact resistant side panels
- 1 ea. Push handle
- 1 ea. Perimeter bumper
- 1 ea. Cord wrap
- 2 ea. Lock hasp with slide bolt
- 1 ea. Energy Star® Certified
- Mounted on heavy duty modulus casters, front two with brakes

Or as manufactured by F.W.E. or Metro.

ITEM #6 CABINET, MOBILE, REFRIGERATED – QTY. AS PER PLAN & SCHEDULE

Cres Cor Model R-171-SUA-10E-SD. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Capacity: (10) 18" x 26" Pans or (20) 12" x 20" Pans
- Verify door hinging
- 1 ea. Self-contained refrigeration
- 1 ea. LED digital display
- 1 ea. High impact resistant side panels
- 1 ea. Push handle
- 1 ea. Perimeter bumper, 1405-164
- 1 ea. Cord wrap

- 1 ea. Lock hasp with slide bolt
- 1 ea. Energy Star® Certified
- Mounted on heavy duty modulus casters, front two with brakes

Or as manufactured by F.W.E. or Metro.

ITEM #7 WORK COUNTER W/ SINK – QTY. AS PER PLAN & SCHEDULE

EMI New Jersey Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- 1 ea. Built-in work sink, 20" L x 16" W x 12" D
- 1 ea. S.S. Removable sink bowl cover
    - Stainless steel, 14 Gauge
    - Finger holes, lift-off
    - Flush inlay with work sink/top
    - Integral bracket, under counter, to hold when not in use
- 1 ea. Waste valve with lever
- 1 ea. Tail piece
- 1 ea. Waste overflow
- 1 ea. Stainless steel faucet with 12" swing spout and wrist action handles, 1/2" connections
- Cabinet/Door to be flush frame design
- Stainless steel integrated handles, horizontal orientation
- Cylinder locks, keyed alike, as required
- Intermediate stainless steel solid shelves, adjustable
- Stainless steel legs, 6" adjustable

Or as manufactured by Aero Mfg. or IMC/ Teddy.

ITEM #8 SPARE NUMBER

ITEM #9 MILK COOLER – QTY. AS PER PLAN & SCHEDULE

Beverage Air Model SM58HC-S. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- 1 ea. Self-contained refrigeration, cold wall
- 1 ea. Electronic control
- 1 ea. Three year parts warranty
- 1 ea. Three year labor warranty
- 1 ea. Energy Star® Certified
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Continental Refrigeration or True Mfg.

ITEM #10 COLD FOOD COUNTER, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model 4-BCM. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Counter Top Material: Stainless Steel, 14 Gauge
- Tray Slide: Solid 3-ribbed tray slide, SRTS
- Front Panels: Formica laminate finish, FRMA, as selected by architect
- End Panels: Formica laminate finish, FRMA, as selected by architect
- Counter Heights: 34" Counter Top, 32" Tray Slide
- 1 ea. 8" Stainless steel cutting board, SCB
- 1 ea. Filler panels FLP, where counters meet
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by EMI New Jersey and Aero Mfg.

ITEM #11 FOOD PROTECTOR(S), ADJUSTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model CG. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Gearless adjustment brackets
- 1" Tubular stainless steel posts
- Extend 16" above counter top, overall height
- Anchored below to counter frame for rigidity
- Stainless steel sleeve post extends thru counter top
- 3/8" Tempered glass, horizontal/vertical surfaces

Or as manufactured by Premier or Versa-Gard.

ITEM #12 FLAT TOP COUNTER, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model 2-ST. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Counter Top Material: Stainless Steel, 14 Gauge
- Tray Slide: Solid 3-ribbed tray slide, SRTS
- Front Panels: Formica laminate finish, FRMA, as selected by architect
- End Panels: Formica laminate finish, FRMA, as selected by architect
- Counter Heights: 34" Counter Top, 32" Tray Slide
- 1 ea. 8" Stainless steel cutting board, SCB
- 1 ea. Filler panels, FLP, where counters meet
- 1 ea. Open under storage with shelf, ROU
- 1 ea. Duplex receptacle mounted in apron, S.S. cover plates, DOUT
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by EMI New Jersey and Aero Mfg.

ITEM #13 HOT FOOD COUNTER, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model HF-4. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 208/1, NEMA 6-30P
- Counter Top Material: Stainless Steel, 14 Gauge
- Tray Slide: Solid 3-ribbed tray slide, SRTS
- Front Panels: Formica laminate finish, FRMA, as selected by architect
- End Panels: Formica laminate finish, FRMA, as selected by architect
- Counter Heights: 34" Counter Top, 32" Tray Slide
- 1 ea. Bottom accessible elements
- 1 ea. 8" Stainless steel cutting board, SCB
- 1 ea. Filler panels FLP, where counters meet
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by EMI New Jersey and Aero Mfg.

ITEM #14 FOOD PROTECTOR(S), ADJUSTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model CG. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Gearless adjustment brackets
- 1" Tubular stainless steel posts
- Extend 16" above counter top, overall height
- Anchored below to counter frame for rigidity
- Stainless steel sleeve post extends thru counter top
- 3/8" Tempered glass, horizontal/vertical surfaces

Or as manufactured by Premier or Versa-Gard.

ITEM #15 CASHIER COUNTER, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model 2-CD. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Counter Top Material: Stainless Steel, 14 Gauge
- Tray Slide: Solid 3-ribbed tray slide, SRTS
- Front Panels: Formica laminate finish, FRMA, as selected by architect
- End Panels: Formica laminate finish, FRMA, as selected by architect
- Counter Heights: 34" Counter Top, 32" Tray Slide
- 1 ea. Stainless steel tubular foot rest, TFR
- 1 ea. Duplex receptacle mounted in panel, S.S. cover plates, DOUT
- 1 ea. Data/ network port outlet mounted in panel
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by EMI New Jersey and Aero Mfg.

SEELY PLACE ELEMENTARY SCHOOL

ITEM #1 HAND SINK, WALL MNTD. – QTY. AS PER PLAN & SCHEDULE

Eagle Group/Metal Masters Model HSA-10-FDPS. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- 1 ea. Electronic faucet, gooseneck
- 1 ea. Soap dispenser
- 1 ea. Towel dispenser
- 1 ea. Left and right splash guards
- Wall backing by General Contractor

Or as manufactured by Aero Mfg. or IMC/ Teddy.

ITEM #2 3-COMPARTMENT SINK – QTY. AS PER PLAN & SCHEDULE

Eagle Group/Metal Masters Model FN2060-3-18-14/3. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- 3 ea. Built-in work sinks, 20" L x 20" W x 14" D
- 3 ea. Waste valve with lever, Fisher Mfg. model DrainKing
- 3 ea. Tail piece, Fisher Mfg. model 6129
- 3 ea. Waste overflow, Fisher Mfg.
- 1 ea. Stainless steel pre-rinse assembly with 12" swing spout add-on faucet and wrist action handles, 1/2" connections
- 1 ea. Stainless steel faucet with 12" swing spout and wrist action handles, 1/2" connections
- Flanged feet bolted to floor

Or as manufactured by Aero Mfg. or IMC/ Teddy.

ITEM #3 STORAGE SYSTEM, WALL MNTD. – QTY. AS PER PLAN & SCHEDULE

Eagle Group/Metal Masters Model WAL-STOR. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Mounting Height: 50" above finished floor
- 2 ea. Wall grid/mat, WM1848-E, stacked
- 1 ea. Wall uprights, vertical, PR45VU-E
- 2 ea. Shelf, 1448-E
- 2 ea. Shelf Brackets, PR14B-E
- 1 ea. Grid Shelf, 1436WGS-E
- 2 ea. Baskets, WB-E
- 12 ea. Utility Hooks, UH-E
- 1 ea. Epoxy coated finish, entire wall system
- Wall backing by General Contractor

Or as manufactured by Focus or Metro.

ITEM #4 STORAGE SHELVING, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Metro Model MQ2160G. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Shelving to be sized to fit
- 5 ea. 21" x 60" Shelves with removable, vented inserts
- 4 ea. 74" High uprights
- 1 ea. Tool free shelf adjustment
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Eagle Group/Metal Masters or Cambro.

ITEM #5 CABINET, MOBILE, WARM/ HOLD – QTY. AS PER PLAN & SCHEDULE

Cres Cor Model H-137-SUA-12D-SD. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Capacity: (12) 18" x 26" Pans or (24) 12" x 20" Pans
- Verify door hinging
- 1 ea. LED digital display
- 1 ea. High impact resistant side panels
- 1 ea. Push handle
- 1 ea. Perimeter bumper
- 1 ea. Cord wrap
- 2 ea. Lock hasp with slide bolt
- 1 ea. Energy Star® Certified
- Mounted on heavy duty modulus casters, front two with brakes

Or as manufactured by F.W.E. or Metro.

ITEM #6 CABINET, MOBILE, REFRIGERATED – QTY. AS PER PLAN & SCHEDULE

Cres Cor Model R-171-SUA-10E-SD. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Capacity: (10) 18" x 26" Pans or (20) 12" x 20" Pans
- Verify door hinging
- 1 ea. Self-contained refrigeration
- 1 ea. LED digital display
- 1 ea. High impact resistant side panels
- 1 ea. Push handle
- 1 ea. Perimeter bumper, 1405-164
- 1 ea. Cord wrap
- 1 ea. Lock hasp with slide bolt
- 1 ea. Energy Star® Certified
- Mounted on heavy duty modulus casters, front two with brakes

Or as manufactured by F.W.E. or Metro.

ITEM #7 WORK COUNTER W/ SINK – QTY. AS PER PLAN & SCHEDULE

EMI New Jersey Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Counter Top Material: Stainless Steel, 14 Gauge
- 1 ea. Built-in work sink, 20" L x 16" W x 12" D
- 1 ea. S.S. Removable sink bowl cover
    - Stainless steel, 14 Gauge
    - Finger holes, lift-off
    - Flush inlay with work sink/top
    - Integral bracket, under counter, to hold when not in use
- 1 ea. Waste valve with lever
- 1 ea. Tail piece
- 1 ea. Waste overflow
- 1 ea. Stainless steel faucet with 12" swing spout and wrist action handles, 1/2" connections
- Cabinet/Door to be flush frame design
- Stainless steel integrated handles, horizontal orientation
- Cylinder locks, keyed alike, as required
- Intermediate stainless steel solid shelves, adjustable
- Stainless steel legs, 6" adjustable

Or as manufactured by Aero Mfg. or IMC/ Teddy.

ITEM #8 HAND SINK, BUILT-IN – QTY. AS PER PLAN & SCHEDULE

EMI New Jersey Model Custom. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- 1 ea. Electronic faucet
- 1 ea. Built-in hand sink, 12" L x 10" W x 7" D, tapered
- 1 ea. Soap dispenser, Component Hardware Model KS10-1000
- 1 ea. Integral towel dispenser, C-fold
- 1 ea. Integral raised stainless steel splashes, perimeter
- 1 ea. Rear / off-set drain connection

Or as manufactured by Aero Mfg. or IMC/ Teddy.

ITEM #9 MILK COOLER – QTY. AS PER PLAN & SCHEDULE

Beverage Air Model SM58HC-S. Unit to be installed where shown on drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- 1 ea. Self-contained refrigeration, cold wall
- 1 ea. Electronic control
- 1 ea. Three year parts warranty
- 1 ea. Three year labor warranty
- 1 ea. Energy Star® Certified

- Mounted on heavy duty casters, front two with brakes

Or as manufactured by Continental Refrigeration or True Mfg.

ITEM #10 COLD FOOD COUNTER, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model 4-BCM. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Counter Top Material: Stainless Steel, 14 Gauge
- Tray Slide: Solid 3-ribbed tray slide, SRTS
- Front Panels: Formica laminate finish, FRMA, as selected by architect
- End Panels: Formica laminate finish, FRMA, as selected by architect
- Counter Heights: 34" Counter Top, 32" Tray Slide
- 1 ea. 8" Stainless steel cutting board, SCB
- 1 ea. Filler panels FLP, where counters meet
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by EMI New Jersey and Aero Mfg.

ITEM #11 FOOD PROTECTOR(S), ADJUSTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model CG. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Gearless adjustment brackets
- 1" Tubular stainless steel posts
- Extend 16" above counter top, overall height
- Anchored below to counter frame for rigidity
- Stainless steel sleeve post extends thru counter top
- 3/8" Tempered glass, horizontal/vertical surfaces

Or as manufactured by Premier or Versa-Gard.

ITEM #12 FLAT TOP COUNTER, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model 2-ST. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Counter Top Material: Stainless Steel, 14 Gauge
- Tray Slide: Solid 3-ribbed tray slide, SRTS
- Front Panels: Formica laminate finish, FRMA, as selected by architect
- End Panels: Formica laminate finish, FRMA, as selected by architect
- Counter Heights: 34" Counter Top, 32" Tray Slide
- 1 ea. 8" Stainless steel cutting board, SCB
- 1 ea. Filler panels, FLP, where counters meet
- 1 ea. Open under storage with shelf, ROU

- 1 ea. Duplex receptacle mounted in apron, S.S. cover plates, DOUT
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by EMI New Jersey and Aero Mfg.

ITEM #13 HOT FOOD COUNTER, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model HF-4. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 208/1, NEMA 6-30P
- Counter Top Material: Stainless Steel, 14 Gauge
- Tray Slide: Solid 3-ribbed tray slide, SRTS
- Front Panels: Formica laminate finish, FRMA, as selected by architect
- End Panels: Formica laminate finish, FRMA, as selected by architect
- Counter Heights: 34" Counter Top, 32" Tray Slide
- 1 ea. Bottom accessible elements
- 1 ea. 8" Stainless steel cutting board, SCB
- 1 ea. Filler panels FLP, where counters meet
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by EMI New Jersey and Aero Mfg.

ITEM #14 FOOD PROTECTOR(S), ADJUSTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model CG. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Gearless adjustment brackets
- 1" Tubular stainless steel posts
- Extend 16" above counter top, overall height
- Anchored below to counter frame for rigidity
- Stainless steel sleeve post extends thru counter top
- 3/8" Tempered glass, horizontal/vertical surfaces

Or as manufactured by Premier or Versa-Gard.

ITEM #15 CASHIER COUNTER, PORTABLE – QTY. AS PER PLAN & SCHEDULE

Piper Products Model 2-CD. Size, shape and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on contract drawings. Provided with all features, options and accessories, per quantity required, as indicated:

- Electrical: 120/1, NEMA 5-15P
- Counter Top Material: Stainless Steel, 14 Gauge
- Tray Slide: Solid 3-ribbed tray slide, SRTS
- Front Panels: Formica laminate finish, FRMA, as selected by architect
- End Panels: Formica laminate finish, FRMA, as selected by architect
- Counter Heights: 34" Counter Top, 32" Tray Slide
- 1 ea. Stainless steel tubular foot rest, TFR

- 1 ea. Duplex receptacle mounted in panel, S.S. cover plates, DOUT
- 1 ea. Data/ network port outlet mounted in panel
- Mounted on heavy duty casters, front two with brakes

Or as manufactured by EMI New Jersey and Aero Mfg.

PART 3 - EXECUTION

3.1 GENERAL RELATED CONDITIONS

A. In each item of equipment hereinafter specified under the "Equipment Schedule," these specifications shall only identify each respective item by name and model number, as well as list various component parts/ accessories provided for same.

B. Therefore, it shall be intended that these respective items and their component parts shall be of material (mounted where applicable) constructed and furnished in strict accordance to that described in the general specifications for these items and integrally constructed where applicable.

C. It shall also be intended that where buy-out (pre-fabricated) items are specified, same shall be definitely furnished with all the accessories as normally furnished by manufacturer for these items. Also in strict accordance with current manufacturer's engineering data sheet for each respective item.

D. Should no list or description be provided for various component parts/ accessories, the Kitchen Equipment Contractor is responsible to provide required components for full and proper operation of said equipment.

3.2 EXAMINATION OF PLANS AND SPECIFICATIONS

A. Prospective bidders for this work must examine these plans and specifications carefully before bidding, and must request from Architect and/or Food Service Consultant in writing for an interpretation or correction of every apparent ambiguity, inconsistency or error therein. If necessary, such interpretation or correction shall be issued in writing as an addendum.

3.3 SPECIAL NOTES

A. It shall be the responsibility of Kitchen Equipment Contractor to make as many visits to the job site as is necessary and to keep up to date with progress made in field on the installation of all necessary rough-in to adequately and properly operate and accommodate all equipment furnished by said Contractor and as shown on drawings. Include this service in bid.

B. Kitchen Equipment Contractor to cooperate with all trades so that the end results of his/her work will be a satisfactory, approved and accepted installation. Written reports of each visit shall be sent promptly to the Architect and/or Food Service Consultant.

3.4 COORDINATION

A. Procedure of construction is of paramount importance in executions of this project. Kitchen Equipment Contractor to carry on his/her work so that no delay in his/her operations or those of any other contractors occurs at any time.

B. Kitchen Equipment Contractor to verify with Architect and/or Food Service Consultant as to opening date of the food service area(s), and schedule his/her fabrication and purchasing of equipment so that all will be in readiness, installed, connected, tested, demonstrated, etc., in ample time prior to the scheduled opening date.

3.5 DELIVERY AND INSTALLATION

A. Shall mean and intend that Kitchen Equipment Contractor shall deliver and assemble all equipment of contract in 1 piece in required locations in building, ready for water, waste, gas, electric and ventilating connections required by other trades.

B. Any pieces of equipment may be delivered sectionally, but all working surfaces butt-welded, ground and polished on premises so that upon completion, such item of equipment will have true, smooth, even and continuous surfaces. Butt joining and filling with solder not permitted.

C. Kitchen Equipment Contractor must verify door sizes, delivery platform, elevator size, etc., effecting delivery to food service area(s) for all items of equipment.

3.6 RESERVATIONS AND CONDITIONS

A. It is the intent of this specification to complete the installation of all equipment covered herein in all phases ready for operation. Contractor shall carefully examine the plans and specifications for building construction contracts and determine therefrom the extent of his operations in all respects. All labor and materials not included in building construction contracts necessary to accomplish this intent are hereby included in this contract.

B. Kitchen Equipment Contractor shall attend job meetings when required for purpose of coordinating his/her work with other trades.

C. All equipment shall be received at the building fully protected. It will be the responsibility of the Kitchen Equipment Contractor to protect the equipment until completely installed and accepted.

3.7 NOT USED

END OF SECTION

SECTION 12 3600
SOLID SURFACING WINDOW SILLS

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 SECTION INCLUDES

A. Window Sills.

1.3 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

B. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation .

D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than 3 years of documented experience.

B. Manufacturer: Company specializing in manufacturing the products specified in this section, with minimum ten years of documented experience.

C. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org.
   2. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6 MOCK-UP

A. Provide mockup for Sills, Head, and Jambs.

B. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from Project site.

C. See Section 01 4000 - Quality Requirements for additional requirements.

D. Locate where directed.

E. Mock-up may remain as part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer's standard warranty for material only for period of 10 years against defects and/or deficiencies.

C. Correct defective Work within a two year period after Date of Substantial Completion, at no additional cost to Edgemont School District. Defects include, but are not limited to:
   1. Cracks.
   2. Discoloration or lack of finish integrity.
   3. Failure of adhesives.

PART 2 PRODUCTS

2.1 WINDOW SILL ASSEMBLIES

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Window Sills, Head, and Jamb: Solid surfacing sheet or plastic resin casting over continuous substrate:
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         a) Dupont: www.corian.com.
         b) Meganite, Inc; _____: www.meganite.com.
      b. Substitutions: See Section 01 2500 Substitution Procedures.
   3. Surface Burning Characteristics: Flame spread 25, maximum; smoke developed 25, maximum; when tested in accordance with ASTM E84.
   4. Finish on Exposed Surfaces: Polished, gloss rating of 55 to 80.
   5. Color and Pattern: As indicated on finish schedule.
   6. Exposed Edge Treatment: Built up to minimum 1 inch thick; radiused edge.

2.2 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 1/2 inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Refer to Section 07 9200 - Joint Sealants.

2.3 FABRICATION

A. Field measure and verify all dimensions before fabrication is complete.

B. Fabricate sills, head, and jambs up to 72" in one sections as practicable .
   1. Fabricate to overhang fronts and sides 1 inch or as shown on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Owner's representative of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Attach solid surfacing sills, head, and jambs using compatible silicone bonding material.

B. Seal joint between sills, head, and jambs and adjacent surfaces.

C. Cut and finish edges with clean sharpe returns.

D. Provide radius at outside corners.

E. Dress joints smooth, remove surface scratches and clean entire surfaces.

F. Install to comply with all manufactures written instructions, including for adhesive, sealers, fabrication and finishing.

3.4 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

3.5 CLEANING

A. Clean surfaces thoroughly. Remove adhesives, sealant and other stains.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

SECTION 221116
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide Domestic water piping in accordance with the Contract Documents." The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

B. Section Includes:

1. Aboveground domestic water pipes, tubes, fittings, and specialties inside the building.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1.3 SUBMITTALS

A. Product Data: For the following products:

1. Specialty valves.
2. Transition fittings.
3. Dielectric fittings.
4. Flexible connectors.
5. Escutcheons.
6. Sleeves and sleeve seals.
7. Water penetration systems.

B. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Fire-suppression-water piping.
2. Domestic water piping.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
5. Copper Pressure-Seal-Joint Fittings:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Elkhart Products Corporation; Industrial Division.
2) NIBCO INC.
3) Viega; Plumbing and Heating Systems.

b. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
c. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

6. Copper-Tube Extruded-Tee Connections:

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) T-DRILL Industries Inc.

b. Description: Tee formed in copper tube according to ASTM F 2014.

2.3 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Hart Industries International, Inc.
   e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   f. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Description:

   a. Pressure Rating: 150 psig (1035 kPa) at 180 deg F (82 deg C).
   b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

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 or approved equal:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Factory-fabricated, bolted, companion-flange assembly.
   b. Pressure Rating: 175 psig (1200 kPa) minimum.
   c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

   a. Calpico, Inc.
   b. Lochinvar Corporation.

2. Description:

   a. Galvanized-steel coupling.
   b. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
   c. End Connections: Female threaded.
   d. Lining: Inert and noncorrosive, thermoplastic.

E. Dielectric Nipples:

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 or approved equal:

    a. Perfection Corporation; a subsidiary of American Meter Company.
    b. Precision Plumbing Products, Inc.
    c. Victaulic Company.

2. Description:

    a. Electroplated steel nipple complying with ASTM F 1545.
    b. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
    c. End Connections: Male threaded or grooved.
    d. Lining: Inert and noncorrosive, propylene.

2.5 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated or rough-brass finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One Piece, Stamped Steel: Chrome-plated finish with setscrew or spring clips.

E. Split Casting, Cast Brass: Polished, chrome-plated or rough-brass finish with concealed hinge and setscrew.

F. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge, setscrew or spring clips.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.6 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

C. Molded-PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

D. Molded-PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

E. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

F. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

G. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.7 SLEEVE SEALS

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 or approved equal:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install shutoff valve immediately upstream of each dielectric fitting.

C. Install domestic water piping level and plumb.

D. Install seismic restraints on piping.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping adjacent to equipment and specialties to allow service and maintenance.

I. Install piping to permit valve servicing.

J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

G. Ductile-Iron-Piping Grooved Joints: Cut groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join ductile-iron pipe and grooved-end fittings according to AWWA C606 for ductile-iron-pipe, cut-grooved joints.

H. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

A. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

3.6 HANGER AND SUPPORT INSTALLATION

A. Hangers and Supports for Plumbing Piping and Equipment.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m) If Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.

E. Install supports for vertical copper tubing every 10 feet (3 m).

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32) and Smaller: 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.

G. Install supports for vertical steel piping every 15 feet (4.5 m).

H. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.8 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with rough-brass finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.9 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.

G. Seal space outside of sleeves in concrete slabs and walls with grout.

H. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

I. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.

    a. Extend sleeves 2 inches (50 mm) above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

    a. PVC pipe sleeves for pipes smaller than NPS 6 (DN 150).
    b. Galvanized-steel sheet sleeves for pipes NPS 6 (DN 150) and larger.
    c. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Interior Concrete Walls:

    a. Steel pipe sleeves for pipes smaller than NPS 6 (DN 150).

J. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Penetration Firestopping" for firestop materials and installations.

3.10 SLEEVE SEAL INSTALLATION

A. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.11 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 15 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.12 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by the City of New York.
2. During installation, notify the City of New York at least one day before inspection must be made. Perform tests specified below in presence of the City of New York:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for the City of New York to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If the City of New York find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by the City of New York.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.13 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.

3. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
5. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.14 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:

1. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and soldered joints.
3. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper pressure-seal-joint fittings; and pressure-sealed joints.

4. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper push-on-joint fittings; and push-on joints.

3.15 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 (DN 50) and smaller.
2. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

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SECTION 221316S

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

C. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings:

1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.

C. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) ANACO.
2) Fernco, Inc.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.

5) Tyler Pipe; Soil Pipe Div.

2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) ANACO.
2) Clamp-All Corp.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

3. Heavy-Duty, Shielded, Cast-Iron Couplings: ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) MG Piping Products Co.

2.5 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade A or B, Standard Weight or Schedule 40, galvanized. Include ends matching joining method.

B. Drainage Fittings: ASME B16.12, galvanized, threaded, cast-iron drainage pattern.

C. Pressure Fittings:

1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.
4. Cast-Iron Flanges: ASME B16.1, Class 125.
5. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.

D. Grooved-Joint Systems:

1. Available Manufacturers:

a. Anvil International.
b. Star Pipe Products; Star Fittings Div.
c. Victaulic Company.
d. Ward Manufacturing, Inc.

2. Grooved-End, Steel-Piping Fittings: ASTM A 47/A 47M, galvanized, malleable-iron casting; ASTM A 106, galvanized-steel pipe; or ASTM A 536, galvanized, ductile-iron casting; with dimensions matching steel pipe.
3. Grooved-End, Steel-Piping Couplings: AWWA C606, for steel-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

2.6 STAINLESS-STEEL PIPE AND FITTINGS

A. Pipe and Fittings: ASME A112.3.1, drainage pattern with socket and spigot ends.

B. Gaskets: Lip seals shaped to fit socket groove, with plastic backup ring.

1. Material: EPDM, unless NBR is indicated.

2.7 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end, unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end, unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

C. Grooved-Joint Systems:

1. Available Manufacturers:

a. Victaulic Company.

2. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
3. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

D. Flanges: ASME 16.1, Class 125, cast iron.

2.8 SPECIAL PIPE FITTINGS

A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Available Manufacturers:

a. Dallas Specialty & Mfg. Co.
b. Fernco, Inc.
c. Logan Clay Products Company (The).
d. Mission Rubber Co.
e. NDS, Inc.
f. Plastic Oddities, Inc.

2. Sleeve Materials:

a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Available Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Mission Rubber Co.

C. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Available Manufacturers:

a. EBAA Iron Sales, Inc.
b. Romac Industries, Inc.
c. Star Pipe Products; Star Fittings Div.

D. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Available Manufacturers:

a. SIGMA Corp.

2.9 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Steel pipe, drainage fittings, and threaded joints.
4. Stainless-steel pipe and fittings, gaskets, and gasketed joints.
5. Copper DWV tube, copper drainage fittings, and soldered joints.

C. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

3. Steel pipe, drainage fittings, and threaded joints.
4. Stainless-steel pipe and fittings gaskets, and gasketed joints.
5. Copper DWV tube, copper drainage fittings, and soldered joints.

    a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2 (DN 65 and DN 90): Hard copper tube, Type M (Type C); copper pressure fittings; and soldered joints.
6. Dissimilar Pipe-Material Couplings: Flexible, Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

D. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 (DN 40 and DN 50) shall be any of the following:

1. Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.
2. Steel pipe, pressure fittings, and threaded joints.

2.10 PIPING INSTALLATION

A. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

B. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

C. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.

D. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

2.11 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

E. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

2.12 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.

G. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
4. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.
5. NPS 3 (DN 80): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.
6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.

I. Install supports for vertical steel piping every 15 feet (4.5 m).

J. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 (DN 50): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 96 inches (2400 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 (DN 100): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.

K. Install supports for vertical stainless-steel piping every 10 feet (3 m).

L. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
3. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
4. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.

M. Install supports for vertical copper tubing every 10 feet (3 m).

2.13 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

2.14 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

2.15 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

SECTION 221319

SANITARY WASTE PIPING SPECIALTIES

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. Floor drains.
2. Floor sinks.
3. Cleanouts.
4. Floor cleanouts.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that FOG disposal systems, grease interceptors, accessories, and components will withstand seismic forces defined in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:

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) Josam Company.
2) MIFAB, Inc.
3) Smith, Jay R. Mfg. Co.
4) Tyler Pipe.
5) Watts Drainage Products.
6) Zurn Plumbing Products Group.

B. Metal Floor Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:

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) Josam Company.
2) Oatey.
3) Sioux Chief Manufacturing Co., Inc.
4) Smith, Jay R. Mfg. Co.
5) Tyler Pipe.

6) Watts Drainage Products.
7) Zurn Plumbing Products Group.

C. Cast-Iron Wall Cleanouts:

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. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk, threaded cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Square, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

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. Commercial Enameling Co.
   b. Josam Company; Josam Div.
   c. MIFAB, Inc.
   d. Prier Products, Inc.
   e. Smith, Jay R. Mfg. Co.
   f. Tyler Pipe; Wade Div.
   g. Watts Drainage Products.
   h. Zurn Plumbing Products Group

2. Standard: ASME A112.6.3.
3. Pattern: Floor Sanitary drain.
4. Body Material: Cast iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Top or Strainer Material: Nickel bronze.
10. Top Shape: Round.
11. Top Loading Classification: Light-Duty.
12. Inlet Fitting: Gray iron, with threaded inlet and threaded and trap-seal primer valve connection.
13. Trap Material: Cast iron.
14. Trap Pattern: Standard P-trap.

15. Trap Features: Trap-seal primer valve drain connection.

B. Stainless-Steel Floor Sink:

1. ASME A112.6.3, Stainless-Steel Floor Sink:

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) Josam Company.
2) Kusel Equipment Co.
3) Scherping Systems, Inc.
4) Smith, Jay R. Mfg. Co.
5) Tyler Pipe.
6) Watts Drainage Products.
7) Zurn Plumbing Products Group.

2. Standard: ASME A112.6.7.
3. Outlet: Bottom.
4. Top or Strainer Material: Stainless steel.
5. Top Shape: Square.
6. Dimensions of Top or Strainer: sump, and grate.
7. Seepage Flange: Not required.
8. Anchor Flange: Not required.
9. Clamping Device: Not required.
10. Trap-Primer Connection: Not required.
11. Trap Material: Stainless steel.
12. Trap Pattern: Standard P-trap.

2.3 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

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. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded, and trap-seal primer valve connection.

2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm thickness).
2. Vent Pipe Flashing: 8 oz./sq. ft. (2.5 kg/sq. m or 0.27-mm thickness).

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
    b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
    c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

G. Install through-penetration firestop assemblies in plastic stacks at floor penetrations.

H. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

I. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

J. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

K. Install wood-blocking reinforcement for wall-mounting-type specialties.

L. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 231123

FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Service meters.
7. Concrete bases.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating Pressure Ratings:

1. Piping and Valves: 125 psig minimum unless otherwise indicated.
2. Service Regulators: 125 psig minimum unless otherwise indicated.
3. Minimum Operating Pressure of Service Meter: 2 psig.

B. Natural Gas System Pressure within Buildings: 0.5 psig but not more than 2 psig.

C. Delegated Design: Design restraints and anchors for Natural Gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance

requirements and design criteria indicated, or as approved under requirements of the Fuel Gas Code of this jurisdiction and approving authority.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Steel piping, corrugated stainless steel tubing, associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Service meters. Indicate pressure ratings and capacities. Include bypass fittings and meter bars.
6. Dielectric fittings.

B. Shop Drawings: For facility Natural Gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: 1/4 inch per foot.
2. Detail mounting, supports, and valve arrangements for service meter assembly and pressure regulator assembly.

C. Delegated Design Submittal: For Natural Gas piping and equipment 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. Detail fabrication and assembly of seismic restraints.
2. Design Calculations: Calculate requirements for selecting seismic restraints.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and details, drawn to scale, on which Natural Gas piping is shown and coordinated with other installations, using input from installers of the items involved.

B. Qualification Data: For qualified professional engineer.

C. Welding certificates.

D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pressure regulators and service meters to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing Natural Gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.10 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural Gas Service: Do not interrupt Natural Gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of Natural Gas supply according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of Natural Gas service.
2. Do not proceed with interruption of Natural Gas service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

a. Material Group: 1.1.
b. End Connections: Threaded or butt welding to match pipe.

c. Lapped Face: Not permitted underground.
d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

5. Protective Coating for Underground Piping: Factory applied, three-layer coating of epoxy, adhesive, and PE.

a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

6. Mechanical Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Dresser Piping Specialties; Division of Dresser, Inc.
2) Smith-Blair, Inc.

b. Steel flanges and tube with epoxy finish.
c. Buna-nitrile seals.
d. Steel bolts, washers, and nuts.
e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

B. Corrugated, Stainless steel Tubing: Comply with ANSI/IAS LC 1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. OmegaFlex, Inc.
b. Parker Hannifin Corporation; Parflex Division.
c. Titeflex.
d. Tru-Flex Metal Hose Corp.

2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
3. Coating: PE with flame retardant.

a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1) Flame Spread Index: 25 or less.
2) Smoke Developed Index: 50 or less.

4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating Pressure Rating: 5 psig (34.5 kPa).

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless steel tubing with polymer coating.
5. Operating Pressure Rating: 0.5 psig - 2.0 psig.
6. End Fittings: Zinc coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: [40] [60]-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

C. Quick Disconnect Devices: Comply with ANSI Z21.41.

1. Copper alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

D. Weatherproof Vent Cap: Cast- or malleable iron increaser fitting with corrosion resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.

2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
6. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Lee Brass Company.
   b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig (862 kPa).
7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for Natural Gas service with "WOG" indicated on valve body.

E. Cast Iron, Non-lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. McDonald, A. Y. Mfg. Co.
   b. Mueller Co.; Gas Products Div.
   c. Xomox Corporation; a Crane company.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).

9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for Natural Gas service with "WOG" indicated on valve body.

F. Cast Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Flowserve.
   b. Homestead Valve; a division of Olson Technologies, Inc.
   c. McDonald, A. Y. Mfg. Co.
   d. Milliken Valve Company.
   e. Mueller Co.; Gas Products Div.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for Natural Gas service with "WOG" indicated on valve body.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Meter Company.
   b. Eclipse Combustion, Inc.
   c. Fisher Control Valves and Regulators; Division of Emerson Process Management.
   d. Maxitrol Company.

2. Body and Diaphragm Case: Cast iron or die cast aluminum.
3. Springs: Zink plated steel; interchangeable.
4. Diaphragm Plate: Zink plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.

7. Seal Plug: Ultraviolet stabilized, mineral filled nylon.
8. Single port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field installed, stainless steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig (13.8 kPa).

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Eaton Corporation; Controls Div.
   b. Maxitrol Company.

2. Body and Diaphragm Case: Die cast aluminum.
3. Springs: Zink plated steel; interchangeable.
4. Diaphragm Plate: Zink plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet stabilized, mineral filled nylon.
7. Factory applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 2 psig (13.8 kPa).

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Hart Industries International, Inc.
   b. Jomar International Ltd.
   c. Matco-Norca, Inc.
   d. McDonald, A. Y. Mfg. Co.
   e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: ASSE 1079.
   b. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
   c. End Connections: Solder joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Matco-Norca, Inc.
    b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    c. Wilkins; a Zurn company.

2. Description:

    a. Standard: ASSE 1079.
    b. Factory-fabricated, bolted, companion-flange assembly.
    c. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
    d. End Connections: Solder joint copper alloy and threaded ferrous; threaded Solder joint copper alloy and threaded ferrous.

D. Dielectric Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Description:

    a. Nonconducting materials for field assembly of companion flanges.
    b. Pressure Rating: 150 psig (1035 kPa).
    c. Gasket: Neoprene or phenolic.
    d. Bolt Sleeves: Phenolic or polyethylene.
    e. Washers: Phenolic with steel backing washers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for Natural Gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect Natural Gas piping according to The City of New York Fuel Gas Code to determine that Natural Gas utilization devices are turned off in piping section affected.

C. Comply with The City of New York Fuel Gas Code requirements for prevention of accidental ignition.

3.3 INDOOR PIPING INSTALLATION

A. Comply with The City of New York Fuel Gas Code for installation and purging of Natural Gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install Natural Gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to allow removal plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Concealed Location Installations: Except as specified below, install concealed Natural Gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural Gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floors: Install Natural Gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches (38 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Floor Channels: Install Natural Gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

    a. Exception: Tubing passing through partitions or walls does not require striker barriers.

5. Prohibited Locations:

    a. Do not install Natural Gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    b. Do not install Natural Gas piping in solid walls or partitions.
    c. Do not install Natural Gas piping in egress corridors.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

T. Do not use Natural Gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install pressure gage downstream from each line regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

X. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

Y. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless steel tubing, corrugated aluminum tubing, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.5 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for Natural Gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not over tighten.

3.6 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches ; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

D. Install hangers for horizontal, corrugated stainless steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.

2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.7 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install Natural Gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.8 LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.9 PAINTING

A. Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting interior and exterior Natural Gas piping.

B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    c. Topcoat: Exterior alkyd enamel semigloss or gloss.
    d. Color: Gray.

C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, and piping specialties, except components with factory applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.

    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Interior latex matching topcoat.
    c. Topcoat: Interior latex (low sheen) or (semigloss).
    d. Color: Gray.

2. Alkyd System: MPI INT 5.1E.

    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Interior alkyd matching topcoat.
    c. Topcoat: Interior alkyd (flat) or (semigloss).
    d. Color: Gray.

D. Damage and Touchup: Repair marred and damaged factory applied finishes with materials and by procedures to match original factory finish.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to The City of New York Fuel Gas Code and authorities having jurisdiction.

C. Natural Gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.11 DEMONSTRATION

A. Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.

B. Aboveground Natural Gas piping shall be one of the following:

1. Steel pipe with malleable iron fittings and threaded joints.
2. Steel pipe with wrought steel fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.12 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:

1. Corrugated stainless steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
2. Aluminum tube with flared fittings and joints.
3. Steel pipe with malleable iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable iron fittings and threaded joints.
2. Steel pipe with wrought steel fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

D. Containment Conduit Vent Piping: Steel pipe with malleable iron fittings and threaded or wrought steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.13 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 2 PSIG

A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:

1. Corrugated stainless steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
2. Aluminum tube with flared fittings and joints.
3. Steel pipe with malleable iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable iron fittings and threaded joints.
2. Steel pipe with steel welding fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.

D. Containment Conduit Vent Piping: Steel pipe with malleable iron fittings and threaded or wrought steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:

1. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be one of the following:

1. Bronze plug valve.
2. Cast Iron, non-lubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 (DN 65) and larger shall be one of the following:

1. Bronze plug valve.
2. Cast Iron, non-lubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:

1. Bronze plug valve.

END OF SECTION 231123

SECTION 230130

EXISTING HVAC AIR DISTRIBUTION SYSTEM CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cleaning existing HVAC air-distribution equipment, ducts, plenums, and system components.

1.2 DEFINITIONS

A. ACAC: American Council for Accredited Certification.

B. AIHA-LAP: American Industrial Hygiene Association Lab Accreditation Program

C. ASCS: Air systems cleaning specialist.

D. CESB: Council of Engineering and Scientific Specialty Boards.

E. CMI: Certified Microbial Investigator.

F. CMC: Certified Microbial Consultant.

G. CMR: Certified Microbial Remediator.

H. CMRS: Certified Microbial Remediation Supervisor.

I. EMLAP: Environmental Microbiology Laboratory Accreditation Program.

J. IEP: Indoor Environmental Professional.

K. IICRC: Institute of Inspection, Cleaning, and Restoration Certification.

L. NADCA: National Air Duct Cleaners Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. ASCS Qualifications: A certified member of NADCA

1. Certification: Employ an ASCS certified by NADCA on a full-time basis
2. Supervisor Qualifications: Certified as an ASCS by NADCA

B. IEP Qualifications: CMI who is certified by ACAC and accredited by CESB.

C. IEP Qualifications: CMC who is certified by ACAC and accredited by CESB.

D. CMR Qualifications: Certified by ACAC and accredited by CESB.

E. CMRS Qualifications: Certified by ACAC and accredited by CESB.

PART 2 - PRODUCTS

2.1 HVAC CLEANING AGENTS

A. Description:

1. Formulated for each specific soiled coil condition that needs remedy.

2.2 ANTIMICROBIAL SURFACE TREATMENT

A. Description: Specific product selected shall be as recommended by the IEP based on the specific antimicrobial needs of the specific Project conditions.

1. Formulated to kill and inhibit growth of microorganisms.
2. EPA-registered for use in HVAC systems and for the specific application in which it will be used.
3. Have no residual action after drying, with zero VOC off-gassing.
4. OSHA compliant.
5. Treatment shall dry clear to allow continued visual observation of the treated surface.

PART 3 - EXECUTION

3.1 PREPARATION

A. Inspect HVAC air-distribution equipment, ducts, plenums, and system components to determine appropriate methods, tools, and equipment required for performance of the Work.

B. Cleaning Plan: Prepare a written plan for air-distribution system cleaning that includes strategies and step-by-step procedures.

C. Proceed with work only after conditions detrimental to performance of the Work have been corrected and cleaning plan has been approved.

D. Use the existing service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry and for inspection.

E. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning.

3.2 CLEANING

A. Comply with NADCA ACR.

B. Perform electrical lockout and tagout according to Owner's standards or authorities having jurisdiction.

C. Remove non-adhered substances and deposits from within the HVAC system.

D. Systems and Components to Be Cleaned: All air-moving and -distribution equipment.

E. Collect debris removed during cleaning. Ensure that debris is not dispersed outside the HVAC system during the cleaning process.

1. Particulate Collection: For particulate collection equipment, include adequate filtration to contain debris removed. Locate equipment downwind and away from all air intakes and other points of entry into the building.
2. HEPA filtration with 99.97 percent collection efficiency for particles sized 0.3 micrometer or larger shall be used where the particulate collection equipment is exhausting inside the building,

F. Control odors and mist vapors during the cleaning and restoration process.

G. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning. Restore them to their marked position on completion of cleaning.

H. System components shall be cleaned so that all HVAC system components are visibly clean. On completion, all components must be returned to those settings recorded just prior to cleaning operations.

I. Clean all air-distribution devices, registers, grilles, and diffusers.

J. Clean non-adhered substance deposits according to NADCA ACR and the following:

1. Clean air-handling units, airstream surfaces, components, condensate collectors, and drains.
2. Ensure that a suitable operative drainage system is in place prior to beginning wash-down procedures.
3. Clean evaporator coils, reheat coils, and other airstream components.

K. Air-Distribution Systems:

1. Create service openings in the HVAC system as necessary to accommodate cleaning.
2. Mechanically clean air-distribution systems specified to remove all visible contaminants, so that the systems are capable of passing the HVAC System Cleanliness Tests (see NADCA ACR).

L. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.

M. Mechanical Cleaning Methodology:

1. 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 to safely remove these contaminants from the facility. No cleaning method, or combination of methods, shall be used that could potentially damage components of the HVAC system or negatively alter the integrity of the system.

    a. Use continuously operating vacuum-collection devices to keep each section being cleaned under negative pressure.
    b. Cleaning methods that require mechanical agitation devices to dislodge debris that is adhered to interior surfaces of HVAC system components shall be equipped to safely remove these devices. Cleaning methods shall not damage the integrity of HVAC system components or damage porous surface materials, such as duct and plenum liners.

2. Cleaning Mineral-Fiber Insulation Components:

    a. Fibrous-glass thermal or acoustical insulation elements present in equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment while the HVAC system is under constant negative pressure and shall not be permitted to get wet according to NADCA ACR.
    b. Cleaning methods used shall not cause damage to fibrous-glass components and will render the system capable of passing the HVAC System Cleanliness Tests (see NADCA ACR).
    c. Fibrous materials that become wet shall be discarded and replaced.

N. Coil Cleaning:

1. See NADCA ACR, "Coil Surface Cleaning" Section. Type 1, or Type 1 and Type 2, cleaning methods shall be used to render the coil visibly clean and capable of passing coil cleaning verification.
2. Coil drain pans shall be subject to NADCA ACR, "Non-Porous Surfaces Cleaning Verification." Ensure that condensate drain pans are operational.
3. Electric-resistance coils shall be de-energized, locked out, and tagged before cleaning.
4. Cleaning methods shall not cause any appreciable damage to, cause displacement of, inhibit heat transfer, or cause erosion of the coil surface or fins, and shall comply with coil manufacturer's written recommendations.
5. Rinse thoroughly with clean water to remove any latent residues.

O. Application of Antimicrobial Treatment:

1. Apply antimicrobial agents and coatings if active fungal growth is determined by the IEP to be at Condition 2 or Condition 3 status according to IICRC S520, as analyzed by a laboratory accredited by AIHA-LAP with an EMLAP certificate and with results interpreted by an IEP. Apply antimicrobial agents and coatings according to manufacturer's written recommendations and EPA registration listing after the removal of surface deposits and debris.
2. Apply antimicrobial treatments and coatings after the system is rendered clean.
3. Apply antimicrobial agents and coatings directly onto surfaces of interior ductwork.
4. Microbial remediation shall be performed by a qualified CMR and CMRS.

3.3 CLEANLINESS VERIFICATION

A. Verify cleanliness according to NADCA ACR, "Verification of HVAC System Cleanliness" Section.

B. Surface-Cleaning Verification: Perform visual inspection for cleanliness. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

C. Verification of Coil Cleaning: Coil will be considered clean if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.

D. Prepare a written cleanliness verification report.

3.4 RESTORATION

A. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components according to NADCA ACR, "Restoration and Repair of Mechanical Systems" Section.

B. Restore service openings capable of future reopening. Comply with requirements in Section 233113 "Metal Ducts”.

C. Reseal fibrous-glass ducts. Comply with requirements in Section 233116 "Nonmetal Ducts."

D. Replace fibrous-glass materials that cannot be restored by cleaning or resurfacing. Comply with requirements in Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts."

E. Replace damaged insulation according to Section 230713 "Duct Insulation."

F. Ensure that closures do not hinder or alter airflow.

G. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.

H. Restore manual volume dampers and air-directional mechanical devices inside the system to their marked position on completion of cleaning.

END OF SECTION 230130

SECTION 230500

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide basic mechanical materials and methods in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:
   1. HVAC demolition.
   2. Equipment installation requirements common to equipment sections.
   3. Painting and finishing.
   4. Concrete bases.
   5. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

PART 2 - EXECUTION

2.1 HVAC DEMOLITION

A. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
   1. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
   2. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
   3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to the City of New York.

B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

2.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

2.3 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 9 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

2.4 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi (20.7-MPa) 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

2.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

2.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

END OF SECTION

SECTION 230519

METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide meter and gages for HVAC piping in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.

1.2 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated; include performance curves.

PART 2 - PRODUCTS

2.1 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flo Fab Inc.
2. Miljoco Corporation.
3. Palmer Wahl Instrumentation Group.
4. Tel-Tru Manufacturing Company.
5. Trerice, H. O. Co.
6. Weiss Instruments, Inc.
7. Winters Instruments - U.S.

B. Standard: ASME B40.200.

C. Case: Cast aluminum; 9-inch (229-mm) nominal size unless otherwise indicated.

D. Case Form: Adjustable angle unless otherwise indicated

E. Glass with magnifying lens and blue or red organic liquid.

F. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).

G. Window: Glass.

H. Stem: Aluminum and of length to suit installation.

1. Design for Air-Duct Installation: With ventilated shroud.
2. Design for Thermowell Installation: Bare stem.

I. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.

J. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

A. Standard: ASME B40.200.

B. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.

C. Material for Use with Copper Tubing: CNR.

D. Material for Use with Steel Piping: CRES.

E. Type: Stepped shank unless straight or tapered shank is indicated.

F. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.

G. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.

H. Bore: Diameter required to match thermometer bulb or stem.

I. Insertion Length: Length required to match thermometer bulb or stem.

J. Lagging Extension: Include on thermowells for insulated piping and tubing.

K. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

L. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 DIRECT-MOUNTED, METAL-CASE, DIAL-TYPE PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMETEK, Inc.; U.S. Gauge Div.
2. Ashcroft Inc.
3. Ernst Flow Industries.
4. Flo Fab Inc.
5. Marsh Bellofram.
6. Miljoco Corporation.

7. Noshok.
8. Palmer Wahl Instrumentation Group.
9. REOTEMP Instrument Corporation.
10. Tel-Tru Manufacturing Company.
11. Trerice, H. O. Co.
12. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
13. Weiss Instruments, Inc.
14. WIKA Instrument Corporation - USA.
15. Winters Instruments - U.S.

B. Standard: ASME B40.100.

C. Case: Sealed type; cast aluminum or drawn steel; 4-1/2-inch (114-mm) nominal diameter.

D. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.

E. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

F. Movement: Mechanical, with link to pressure element and connection to pointer.

G. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).

H. Pointer: Dark-colored metal.

I. Window: Glass.

J. Ring: Metal, brass, or stainless steel.

K. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Siphons: Loop-shaped section of brass or stainless-steel pipe with NPS 1/4 or NPS 1/2 (DN 8 or DN 15) pipe threads.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flow Design, Inc.
2. Miljoco Corporation.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
8. Weiss Instruments, Inc.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for air, water, oil, or gas service at 20 to 200 deg F (minus 7 to plus 93 deg C) shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F (minus 35 to plus 136 deg C) shall be EPDM.

E. Test Kit: Furnish one test kit containing one pressure gage and adaptor, one thermometer, and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit test plugs and of length to project into piping.

1. Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch- (51- to 76-mm-) diameter dial and probe. Dial range shall be 0 to 200 psig (0 to 1380 kPa).
2. High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F (minus 18 to plus 104 deg C).
3. Carrying case shall have formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

H. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

I. Install remote-mounted pressure gages on panel.

J. Install valve in piping for each pressure gage for fluids (except steam).

K. Install valve and syphon fitting in piping for each pressure gage for steam.

L. Install test plugs in piping tees.

M. Install liquid-in-glass thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.

2. Inlet and outlet of each hydronic coil in air-handling units.
3. Outside-, return-, supply-, and mixed-air ducts.

N. Provide the following temperature ranges for thermometers:

1. Heating Hot Water: 0 to 250 deg F (0 to 150 deg C).
2. Condenser Water: 0 to 150 deg F (Minus 20 to plus 70 deg C).
3. Chilled Water: 0 to 150 deg F (Minus 20 to plus 70 deg C).
4. Air Ducts: Minus 40 to plus 110 deg F (Minus 40 to plus 45 deg C).

O. Install dial-type pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.
2. Suction and discharge of each pump.

P. Provide the following scale ranges for pressure gages:

1. Heating Hot Water: 0 to 100 psi (0 to 600 kPa).

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance for meters, gages, machines, and equipment.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION

SECTION 230523

GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide general- duty valves for HVAC piping in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Bronze ball valves.
2. Bronze swing check valves.
3. Iron swing check valves.
4. Bronze globe valves.
5. Iron globe valves.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.3 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.4 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, 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 handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 (DN 200) and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller.
4. Locking Lever Handle: For butterfly valves NPS 6 (DN 150) and smaller.
5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With 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: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Red-White Valve Corporation.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: PTFE or TFE.

2.4 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Stockham Division.

2. Description:

    a. Standard: MSS SP-71, Type I.
    b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).
    c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).
    d. Body Design: Clear or full waterway.
    e. Body Material: ASTM A 126, gray iron with bolted bonnet.
    f. Ends: Flanged.
    g. Trim: Composition.
    h. Seat Ring: Bronze.
    i. Disc Holder: Bronze.
    j. Disc: PTFE or TFE.
    k. Gasket: Asbestos free.

C. Class 250, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Jenkins Valves.
    c. Crane Co.; Crane Valve Group; Stockham Division.
    d. Hammond Valve.
    e. Milwaukee Valve Company.
    f. NIBCO INC.
    g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

    a. Standard: MSS SP-71, Type I.
    b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig (3450 kPa).
    c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 300 psig (2070 kPa).
    d. Body Design: Clear or full waterway.
    e. Body Material: ASTM A 126, gray iron with bolted bonnet.
    f. Ends: Flanged.
    g. Trim: Bronze.
    h. Gasket: Asbestos free.

2.5 BRONZE GATE VALVES

A. Class 150, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Stockham Division.
    c. Hammond Valve.
    d. Kitz Corporation.

e. Milwaukee Valve Company.
f. NIBCO INC.
g. Powell Valves.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

2.6 IRON GATE VALVES

A. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

B. Class 250, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.

f. Powell Valves.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig (3450 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 300 psig (2070 kPa).
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

2.7 BRONZE GLOBE VALVES

A. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Hammond Valve.
c. Kitz Corporation.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Powell Valves.
g. Red-White Valve Corporation.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

2.8 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.

h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

B. Class 250, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 500 psig (3450 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service except Steam: Ball, butterfly, or globe valves.
4. Throttling Service, Steam: Butterfly or globe valves.
5. Pump-Discharge Check Valves:

    a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with nonmetallic disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.5 VALVE APPLICATIONS

A. Low-Pressure Steam Piping: Use the following types of valves:

1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 (DN 50) and Smaller: Three-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
5. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.

6. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
7. Gate Valves, NPS 2 (DN 50) and Smaller: Type 3, Class 150, bronze.
8. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
9. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
10. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

B. Steam Condensate Piping: Use the following types of valves:

1. Ball Valves, NPS 2 (DN 50) and Smaller: Three-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
3. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 200, bronze.
4. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
5. Gate Valves, NPS 2 (DN 50) and Smaller: Type 3, Class 200, bronze.
6. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
7. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 200, bronze.
8. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.
9. Plug Valves, NPS 2 (DN 50) and Larger: Class 125 or 150, lubricated-type, cast iron.

END OF SECTION

SECTION 230529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. Related Sections:

1. Section 05 5000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 23 3113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.

C. Delegated-Design Submittal: For trapeze hangers 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. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. Flex-Strut Inc.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut Corporation; Tyco International, Ltd.
    g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc or Hot-dipped galvanized.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International; a subsidiary of Mueller Water Products Inc.
    b. Empire Industries, Inc.
    c. ERICO International Corporation.
    d. Haydon Corporation; H-Strut Division.
    e. NIBCO INC.
    f. PHD Manufacturing, Inc.
    g. PHS Industries, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 230548

VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide vibration controls for HVAC piping and equipment in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Isolation pads.
2. Isolation mounts.
3. Freestanding spring isolators.
4. Elastomeric hangers.
5. Spring hangers.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

B. Shop Drawings: Include the following:

1. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

C. Welding certificates.

D. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Mountings & Controls, Inc.

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene or rubber.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

E. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

F. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.2 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.

2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits.

3.3 VIBRATION-CONTROL DEVICE INSTALLATION

A. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

B. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the Commissioner if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Measure isolator deflection.
2. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust active height of spring isolators.

END OF SECTION

SECTION 230553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black

C. Background Color: White

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction. Duct service identification shall include air handler or fan that ducts are connected to and whether supply, return, etc.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 incheshigh.

2.5 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13.1, on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Refrigeration Piping:

a. Background Color: Green
b. Letter Color: White

3.4 DUCT LABEL INSTALLATION

A. Locate stencils near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide testing, adjusting, and balancing for HVAC in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Balancing Air Systems:

a. Constant-volume air systems.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.4 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by either AABC or NEBB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by either AABC or NEBB.
2. TAB Technician: Employee of the TAB contractor and who is certified by either AABC or NEBB as a TAB technician.

B. TAB Conference: Meet with the City of New York and Commissioner's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.
b. The Contract Documents examination report.
c. TAB plan.
d. Work schedule and Project-site access requirements.
e. Coordination and cooperation of trades and subcontractors.
f. Coordination of documentation and communication flow.

C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing."

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

G. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.5 PROJECT CONDITIONS

A. Partial City of New York Occupancy: City of New York may occupy completed areas of building before Substantial Completion. Cooperate with City of New York during TAB operations to minimize conflicts with City of New York operations.

1.6 COORDINATION

A. Notice: Provide **seven** days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", and SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

   a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.

3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.7 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate-drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.8 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 5 percent .
2. Air Outlets and Inlets: Plus or minus 5 percent
3. Heating-Water Flow Rate: Plus or minus 5 percent
4. Cooling-Water Flow Rate: Plus or minus 5 percent .

3.9 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.10 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing Commissioner.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Commissioner’s name and address.
6. Commissioner name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

a. Indicated versus final performance.
b. Notable characteristics of systems.
c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

a. Settings for outdoor-, return-, and exhaust-air dampers.
b. Conditions of filters.
c. Cooling coil, wet- and dry-bulb conditions.
d. Face and bypass damper settings at coils.
e. Fan drive settings including settings and percentage of maximum pitch diameter.
f. Inlet vane settings for variable-air-volume systems.
g. Settings for supply-air, static-pressure controller.
h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches (mm), and bore.
i. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch (mm) o.c.
f. Make and model number.
g. Face area in sq. ft. (sq. m).
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Average face velocity in fpm (m/s).
c. Air pressure drop in inches wg (Pa).
d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
h. Water flow rate in gpm (L/s).
i. Water pressure differential in feet of head or psig (kPa).
j. Entering-water temperature in deg F (deg C).
k. Leaving-water temperature in deg F (deg C).
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig (kPa).
n. Refrigerant suction temperature in deg F (deg C).
o. Inlet steam pressure in psig (kPa).

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.

e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches (mm), and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

I. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft. (sq. m).

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm .
b. Air velocity in fpm.
c. Preliminary air flow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final air flow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

J. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

K. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.11 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Verify that balancing devices are marked with final balance position.
e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Commissioning Contractor.
2. The TAB contractor's test and balance Commissioner shall conduct the inspection in the presence of Commissioning Contractor.
3. Commissioning Contractor shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, the City of New York may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.12 ADDITIONAL TESTS

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 230715

HVAC DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in unconditioned space.
3. Outdoor, exposed supply and return.

B. Related Sections:

1. Section 23 0716 "HVAC Equipment Insulation."
2. Section 23 0719 "HVAC Piping Insulation."
3. Section 23 3113 "Metal Ducts" for duct liners.

1.2 DEFINITIONS

A. ASJ: All-service jacket.

B. FSK: Foil, scrim, kraft paper.

C. FSP: Foil, scrim, polyethylene.

D. PVDC: Polyvinylidene chloride.

E. SSL: Self-sealing lap.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings: Show details for the following:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Attachment and covering of heat tracing inside insulation.
3. Insulation application at pipe expansion joints for each type of insulation.
4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Removable insulation at piping specialties, equipment connections, and access panels.
6. Application of field-applied jackets.
7. Application at linkages of control devices.
8. Field application for each equipment type.

C. Installer Certificates: Signed by Contractor certifying that installers comply with requirements.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control inspection reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; SoftTouch Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; SOFTR All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Commercial Board.
b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ or ASJ-SSL. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
3. Type II, 1200 deg F (649 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ or ASJ-SSL. Factory -applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

J. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Knauf Insulation; Permawick Pipe Insulation.
b. Owens Corning; VaporWick Pipe Insulation.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F (10 to 427 deg C).

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-97.
b. Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.
c. Marathon Industries, Inc.; 290.
d. Mon-Eco Industries, Inc.; 22-30.
e. Vimasco Corporation; 760.

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aeroseal.
b. Armacell LCC; 520 Adhesive.
c. Foster Products Corporation, H. B. Fuller Company; 85-75.
d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.

d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Red Devil, Inc.; Celulon Ultra Clear.
e. Speedline Corporation; Speedline Vinyl Adhesive.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; Encacel.
b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
c. Marathon Industries, Inc.; 570.
d. Mon-Eco Industries, Inc.; 55-70.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-10.
b. Foster Products Corporation, H. B. Fuller Company; 35-00.
c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
d. Marathon Industries, Inc.; 550.
e. Mon-Eco Industries, Inc.; 55-50.
f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms (2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F (Minus 29 to plus 93 deg C).
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-52.
b. Foster Products Corporation, H. B. Fuller Company; 81-42.
c. Marathon Industries, Inc.; 130.
d. Mon-Eco Industries, Inc.; 11-30.
e. Vimasco Corporation; 136.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F (Minus 46 to plus 82 deg C).
4. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-76.
b. Foster Products Corporation, H. B. Fuller Company; 30-45.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.
f. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
5. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-76-8.
   b. Foster Products Corporation, H. B. Fuller Company; 95-44.
   c. Marathon Industries, Inc.; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following:

   a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms (0.013 metric perms) when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
6. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms (0.007 metric perms) when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

a. Products: Subject to compliance with requirements, provide the following:

1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

8. Vinyl Jacket: UL-rated white vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd. (271 g/sq. m).

1. Products: Subject to compliance with requirements, provide the following:

a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto PVC Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

5. Factory-fabricated tank heads and tank side panels.

D. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; Metal Jacketing Systems.
b. PABCO Metals Corporation; Surefit.
c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

a. Sheet and roll stock ready for shop or field sizing or factory cut and rolled to size.
b. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
c. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
d. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.

a. Sheet and roll stock ready for shop or field sizing or factory cut and rolled to size.
b. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
c. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
d. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms (0.013 metric perms) when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

1. Products: Subject to compliance with requirements, provide the following:

a. Dow Chemical Company (The), Saran 540 Vapor Retarder Film.

F. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.

b. Compac Corp.; 104 and 105.
c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 11.5 mils (0.29 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
b. Compac Corp.; 130.
c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
d. Venture Tape; 1506 CW NS.

2. Width: 2 inches (50 mm).
3. Thickness: 6 mils (0.15 mm).
4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
b. Compac Corp.; 120.
c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
d. Venture Tape; 3520 CW.

2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).

4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide the following:

   a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.

2. Width: 3 inches (75 mm).
3. Film Thickness: 4 mils (0.10 mm).
4. Adhesive Thickness: 1.5 mils (0.04 mm).
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch (10.1 N/mm) in width.

2.10 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products; Bands.
   b. PABCO Metals Corporation; Bands.
   c. RPR Products, Inc.; Bands.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) or 3/4 inch (19 mm) wide with wing or closed seal.
3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) or 3/4 inch (19 mm) wide with wing or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, [0.106-inch- (2.6-mm-)] [0.135-inch- (3.5-mm-)] diameter shank, length to suit depth of insulation indicated.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) AGM Industries, Inc.; CWP-1.
      2) GEMCO; CD.
      3) Midwest Fasteners, Inc.; CD.
      4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, [0.106-inch- (2.6-mm-)] [0.135-inch- (3.5-mm-)] diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) AGM Industries, Inc.; CWP-1.

2) GEMCO; Cupped Head Weld Pin.
3) Midwest Fasteners, Inc.; Cupped Head.
4) Nelson Stud Welding; CHP.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
c. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) GEMCO; Nylon Hangers.
2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
c. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
2) GEMCO; Press and Peel.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, galvanized-steel, aluminum, or stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) AGM Industries, Inc.; RC-150.
      2) GEMCO; R-150.
      3) Midwest Fasteners, Inc.; WA-150.
      4) Nelson Stud Welding; Speed Clips.

   b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) GEMCO.
      2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

D. Wire: 0.062-inch (1.6-mm) soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ACS Industries, Inc.
   b. C & F Wire.
   c. Childers Products.
   d. PABCO Metals Corporation.
   e. RPR Products, Inc.

2.11 CORNER ANGLES

A. PVC Corner Angles: 30 mils (0.8 mm) thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch, aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005; Temper H-14.

C. Stainless-Steel Corner Angles: 0.024 inch (0.61 mm) thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) or 4 inches (100 mm) o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Through-Penetration Firestop Systems."

C. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies according to Division 07 Section "Through-Penetration Firestop Systems."

3.5 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by the Commissioner. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, supply-air ducts.
2. Indoor, outdoor-air ducts.
3. Indoor, exhaust-air ducts between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, duct and plenum insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 0.75-lb/cu. ft. nominal density.

B. All ductwork within 15 feet of a fan/blower shall be internal lined with 1” thick acoustic duct liner.

3.8 OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Exterior Ductwork: Internally insulate with 1" thick liner and cover with 1.5" rigid board insulation. Alternatively, omit lining and cover with 2" rigid board. Install weatherproof self-stick membrane following installation of insulation.

B. In addition to exterior treatment, all ductwork within 15 feet of a fan/blower shall be internal lined with 1" thick acoustic duct liner.

END OF SECTION

SECTION 230719

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide HVAC piping insulation in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.3 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Steam piping, indoors.
2. Steam condensate piping, indoors.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use.

1. Preformed Pipe Insulation Materials: 12 inches (300 mm) long by NPS 2 (DN 50).
2. Sheet Form Insulation Materials: 12 inches (300 mm) square.
3. Jacket Materials for Pipe: 12 inches (300 mm) long by NPS 2 (DN 50).
4. Sheet Jacket Materials: 12 inches (300 mm) square.

5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by commissioner. Use materials indicated for the completed Work.

1. Piping Mockups:

   a. One 10-foot (3-m) section of NPS 2 (DN 50) straight pipe.
   b. One each of a 90-degree threaded, welded, and flanged elbow.
   c. One each of a threaded, welded, and flanged tee fitting.
   d. One NPS 2 (DN 50) or smaller valve, and one NPS 2-1/2 (DN 65) or larger valve.
   e. Four support hangers including hanger shield and insert.
   f. One threaded strainer and one flanged strainer with removable portion of insulation.
   g. One threaded reducer and one welded reducer.
   h. One pressure temperature tap.
   i. One mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify commissioner seven days in advance of dates and times when mockups will be constructed.
4. Obtain commissioner’s approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless commissioner specifically approves such deviations in writing.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.8 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.9 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products:

a. Aeroflex USA, Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied **FSK jacket** complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. (40 kg/cu. m) or more. Thermal conductivity (k-value) at 100 deg F (55 deg C) is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products:

a. CertainTeed Corp.; CrimpWrap.
b. Johns Manville; MicroFlex.
c. Knauf Insulation; Pipe and Tank Insulation.
d. Manson Insulation Inc.; AK Flex.
e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products:

a. Ramco Insulation, Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products:

a. Ramco Insulation, Inc.; Thermokote V.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products:]:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive 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."

C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements,

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive 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."

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products:

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
c. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2. Joint Sealants for Polystyrene Products:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-70.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.

3. Materials shall be compatible with insulation materials, jackets, and substrates.

4. Permanently flexible, elastomeric sealant.
5. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
6. Color: White or gray.
7. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
8. Sealants 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. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements,

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   d. Mon-Eco Industries, Inc.; 44-05.
   e.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants 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."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm (0.013 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

    a. Products: Subject to compliance with requirements,

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

6. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm (0.007 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

    a. Products:

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

    a. Products:

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.8 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements,

    a. ITW Insulation Systems; Gerrard Strapping and Seals.
    b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch or 3/4 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick 3/4 inch wide with wing seal or closed seal.

4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless .

1. Manufacturers:

a. C & F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 8413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket

flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

E. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches (850 mm) or less. The 33-1/2-inch- (850-mm-) circumference limit allows for 2-inch- (50-mm-) overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.8 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by commissioner. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by commissioner, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Steam piping:

1. NPS 3 inches and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2-1/2 inches thick.

B. Steam Condensate piping:

1. NPS 1.5 inches and and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches thick.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:

1. None.
2. PVC: 20 mils thick.
3. Aluminum, Smooth : 0.020 inch thick.
4. Painted Aluminum, Smooth: 0.020 inch o r0.024 inch Stainless Steel, Type 304 or Type 316, Smooth 2B Finish.

END OF SECTION

SECTION 230900

HVAC INSTRUMENTATION AND CONTROLS

1. GENERAL

1.1 Related Documents

A. All work of this Division shall be coordinated and provided by the Building Automation System (BAS) Contractor.

B. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the Division 23 and 24 Sections for details.

C. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.

D. If the BAS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

1.2 DEFINITIONS

A. Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.

B. Binary: A two-state system where an “ON” condition is represented by one discrete signal level and an “OFF” condition is represented by a second discrete signal level.

C. Building Automation System (BAS): The total integrated system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be provided by this Division BAS Contractor and to be interfaced to the associated work of other related trades.

D. BAS Contractor: The Contractor to provide the work of this Division. This Contractor shall be the primary manufacturer, installer, commissioner and ongoing service provider for the BAS work.

E. Control Sequence: A BAS pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control objectives.

F. Direct Digital Control: The digital algorithms and pre-defined arrangements included in the BAS software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.

G. BAS Network: The total digital on-line real-time interconnected configuration of BAS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements individually known as network nodes. May exist as one or more fully interfaced and integrated sub-networks, LAN, WAN or the like.

H. Node: A digitally programmable entity existing on the BAS network.

I. BAS Integration: The complete functional and operational interconnection and interfacing of all BAS work elements and nodes in compliance with all applicable codes, standards and ordinances so as to provide a single coherent BAS as required by this Division.

J. Provide: The term "Provide" and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, commission, warrant, document and supply the associated required services ready for operation.

K. PC: IBM-compatible Personal Computer from a recognized major manufacturer

L. Furnish: The term "Furnish" and its derivatives when used in this Division shall mean supply at the BAS Contractor's cost to the designated third party trade contractor for installation. BAS Contractor shall connect furnished items to the BAS, calibrate, test, commission, warrant and document.

M. Wiring: The term "Wiring" and its derivatives when used in this Division shall mean provide the BAS wiring and terminations.

N. Install: The term "Install" and its derivatives when used in this Division shall mean receive at the jobsite and mount.

O. Protocol: The term "protocol" and its derivatives when used in this Division shall mean a defined set of rules and standards governing the on-line exchange of data between BAS network nodes.

P. Software: The term "software" and its derivatives when used in this Division shall mean all of programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the BAS industry for real-time, on-line, integrated BAS configurations.

Q. The use of words in the singular in these Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.

R. Headings, paragraph numbers, titles, shading, bolding, underscores, clouds and other symbolic interpretation aids included in the Division documents are for general information only and are to assist in the reading and interpretation of these Documents.

S. The following abbreviations and acronyms may be used in describing the work of this Division:

ADC	-	Analog to Digital Converter
AI	-	Analog Input
AN	-	Application Node
ANSI	-	American National Standards Institute
AO	-	Analog Output
ASCII	-	American Standard Code for Information Interchange
ASHRAE		American Society of Heating, Refrigeration and Air Conditioning Engineers
AWG	-	American Wire Gauge
BC	-	Building Controller
CPU	-	Central Processing Unit
CRT	-	Cathode Ray Tube
CZC	-	Commercial Zone Control
DAC	-	Digital to Analog Converter

DC	-	Digital Controller
DCX	-	Digital Controller with extension capability
DCXM	-	Digital Controller Master with extension capability
DDC	-	Direct Digital Control
DI	-	Digital Input
DO	-	Digital Output
EEPROM	-	Electronically Erasable Programmable Read Only Memory
EMI	-	Electromagnetic Interference
EV	-	Commercial Zone Control
FAS	-	Fire Alarm Detection and Annunciation System
GUI	-	Graphical User Interface
HOA	-	Hand-Off-Auto
ID	-	Identification
IEEE	-	Institute of Electrical and Electronics Engineers
I/O	-	Input/Output
LAN	-	Local Area Network
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diode
MCC	-	Motor Control Center
MD	-	Master Display Controller
NC	-	Normally Closed
NIC	-	Not In Contract
NO	-	Normally Open
OWS	-	Operator Workstation
OAT	-	Outdoor Air Temperature
PC	-	Personal Computer
RAM	-	Random Access Memory
RF	-	Radio Frequency
RFI	-	Radio Frequency Interference
RH	-	Relative Humidity
ROM	-	Read Only Memory
RTD	-	Resistance Temperature Device
NAC	-	Network Area Controller
SI	-	Systems Integrator
SPDT	-	Single Pole Double Throw
SPST	-	Single Pole Single Throw
XVGA	-	Extended Video Graphics Adapter
TBA	-	To Be Advised
TEC	-	Networked Thermostat Equipment Controller
TCP/IP	-	Transmission Control Protocol/Internet Protocol
TTD	-	Thermistor Temperature Device
UPS	-	Uninterruptible Power Supply
UNT	-	Unitary Controller
VAC	-	Volts, Alternating Current
VAV	-	Variable Air Volume
VDC	-	Volts, Direct Current
WAN	-	Wide Area Network

1.3 BAS DESCRIPTION

A. The BAS shall consist of Direct Digital Control (DDC) controllers, Building Controllers (BC), network management tools, programming tools, web browser based Graphical User Interface, sensors, relays, valves, actuators, and other equipment as may be necessary to provide for a complete and operational control system for the HVAC and other building related systems as described within these specifications.

B. The BAS Contractor shall be responsible for field inspection of the building(s) to verify exact site conditions, as well as determine the quantities of devices and controls, as well as software required for the existing and or new systems in order to meet the specifications. No allowances will be made if the BAS Contractor fails to make such site examination.

C. The BAS Contractor shall manage and coordinate the BAS work in a timely manner in consideration of the Project schedules. Coordinate with the associated work of other trades so as to not impede or delay the work of associated trades.

D. The documentation contained in this section and other contract documents pertaining to HVAC Controls is schematic in nature. The Contractor shall provide hardware and software necessary to implement the functions shown or as implied in the contract documents.

E. System configuration and monitoring shall be performed via a PC-type computer. Under no circumstances shall the PC be used as a control device for the network. It can be used for storage of data.

F. User Access - The supplied system must incorporate the ability to access all data using standard Web browsers without requiring a proprietary operator/user interface and configuration programs.

G. Building Controllers (BC) - All BCs (devices that provide for communication between the

1.4 Quality Assurance

A. General - The HVAC Control System shall be furnished, engineered, and installed by a licensed Controls Contractor or System Integrator (SI). All work provided under this section shall be provided by direct employees of the SI or under the direct supervision of the SI personnel.

B. System Integrator Qualifications

1. The system integrator must be an authorized factory direct representative in good standing of the manufacturer of the proposed hardware and software components. Provide a letter dated within the last 6 months, from the manufacture certifying that the System Integrator is an authorized factory direct representative.
2. The SI shall have an office within 50 miles of the Building site that is staffed with a minimum of five (5) technicians. SI shall be staffed to provide support services on a 24 hour, 7-day-a-week basis.
3. The SI shall submit a list of no less than three (3) similar projects, which have similar Building Automation Systems as specified herein installed by the SI. These projects must be on-line and functional such that the Owner's/User's representative can observe the system in full operation.

1.5 Submittals

A. Submit 6 complete sets of documentation in the following phased delivery schedule:

1. Valve and damper schedules
2. Equipment data cut sheets
3. System schematics, including:
    a. sequence of operations
    b. point names
    c. point addresses
    d. point to point wiring
    e. interface wiring diagrams
    f. panel layouts
    g. system riser diagrams
4. Visio® or AutoCAD compatible as-built drawings

B. Upon project completion, submit operation and maintenance manuals, consisting of the following:

1. Index sheet, listing contents in alphabetical order
2. Manufacturer's equipment parts list of all functional components of the system, disk of system schematics, including wiring diagrams
3. Description of sequence of operations
4. As-Built interconnection wiring diagrams
5. User’s documentation containing product, system architectural and programming information.
6. Trunk cable schematic showing remote electronic panel locations, and all trunk data
7. List of connected data points, including panels to which they are connected and input device (ionization detector, sensors, etc.)
8. Copy of the warranty
9. Recommended spare parts list

1.6 Training - Meet all applicable Training requirements of Division 1, Division 15, and the following.

A. Instruct the operators how to accomplish control of the system. Include basic troubleshooting and override of equipment and controls in the event of system failure.

B. Training Allowance: Provide not less than (8) hours formal training to the Owner’s designated operations personnel.

C. Training Classes - Prior to conducting training, prepare and submit for approval the proposed training literature and topics. Submit this information at least two weeks prior to the first class.

D. Additional Training - Manufacturer provided training on the use and operation of all products provided within these specifications shall be available for purchase and attendance by the Owner or his designated agent. Such training shall be of the same curriculum as the training courses provided by the manufacturer to the System Integrator. A manufac-

turer advanced 4 certified instructor shall give all training classes. A list of training courses and the associated cost shall be provided as part of the BAS submittals.

1.7 Warranty

A. The HVAC Control System shall be free from defects in workmanship and material under normal use and service. If within twelve (12) months from the date of substantial completion or the owner receives beneficial use of the system, the installed equipment is found to be defective in operation, workmanship or materials, the building systems contractor shall replace, repair or adjust the defect at no cost. Service shall be provided within the next business day upon notice from Owner's designated Representative.

B. The warranty shall extend to material that is supplied and installed by the Contractor. Material supplied but not installed by the Contractor shall be covered per the above to the extent of the product only. Installation labor shall be the responsibility of the trade contractor performing the installation.

C. All corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks.

1.8 Ownership of Proprietary Material

A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:

1. Graphics
2. Record drawings
3. Database
4. Application programming code
5. Documentation
6. Provide to the owner the highest level administrative password for the system. This password is to be filed away by the owner and not used during the warranty period. This is to protect the owners' interest in the system they purchased.

1.9 References

A. All work shall conform to the following Codes and Standards, as applicable:

1. National Electric Code (NEC) and all other applicable local Electric Codes.
2. Underwriters Laboratories (UL) listing and labels.
3. UL 916 Energy Management
4. NFPA 70 - National Electrical Code.
5. NFPA 90A - Standard For The Installation Of Air Conditioning And Ventilating Systems.
6. American National Standards Institute (ANSI).
7. National Electric Manufacturer's Association (NEMA).
8. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

9. Institute of Electrical and Electronic Engineers (IEEE).
10. American Standard Code for Information Interchange (ASCII).
11. Electronics Industries Association (EIA).
12. Occupational Safety and Health Administration (OSHA).
13. Federal Communications Commission (FCC) including Part 15, Radio Frequency Devices
14. Americans with Disabilities Act (ADA)
15. ANSI/EIA 909.1-A-1999 (LonWorks)
16. ANSI/ASHRAE Standard 195-2004 (BACnet)

B. In the case of conflicts or discrepancies, the more stringent regulation shall apply.

C. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

2. BUILDING AUTOMATION SYSTEM CONTROLLERS

2.1 All controllers shall be designed for easy installation and servicing including removable enclosures, removable terminals, and factory applied labels for all I/O. All internal points within the Programmable Controllers shall be fully supported by the Graphical User Interface (GUI), allowing the user to easily modify them and monitor them. All of the internal programming points (e.g. variables, constants, PID's, timers, inputs and outputs) shall be exposed to the network on dedicated network variable outputs. All controllers programs and schedules shall contain non-volatile flash memory. Upon a loss of power all controllers shall perform a self restart.

2.2 Programmable Controllers (PC) – a controller designed for more complex sequences of operations such as built up AHU, central plant operations, electrical monitoring, and control and management for chillers, boilers and generators. The PCs are to allow for the flexibility of custom control programming to meet the needed sequences of operation.

2.3 Performance

A. Each PC shall have a minimum of 64K of Non-volatile Flash memory for control applications and 128K non-volatile flash memory for storage with a 8 bit processor. The PC shall have a minimum ambient operating temperature range of -0°C to 70°C or 32°F to 158°F.

B. Inputs – Analog inputs shall have the following minimum level of performance: 16-bit A to D resolution; allow monitoring of platinum 100 ohms, platinum 1000 ohm, nickel 1000 ohms, thermistor 10K type II, thermistor 10K type III, voltage input 0-10VDC, current input 4-20mA, digital input, pulsed input minimum 2 Hz.

C. Outputs – Outputs shall be either software configurable to be either analog or digital or dedicated digital only - Analog outputs shall be selectable as voltage of 0-10 VDC (linear) or 4-20mA or Digital outputs shall be 0-12 VDC (off/on), floating or PWM. Outputs shall have an adjustable range of 2 seconds to 15 minutes. Output Resolution shall be a minimum 8 bits digital / analog converter. All individual outputs and power supply shall be protected by an auto reset fuse. There shall be an LED status indicator on each of the outputs.

D. Programmable Controller Features

1. Provide an onboard network communication jack
2. The PC shall be provided with a diagnostic indicator lights for power and network communication of transmit and receive along with a light indication position for each output
3. Hand/Off/Auto Switches – For all controllers applied to a AHU, Chiller, Pumps Cooling Tower or Boiler, provide for the manual override and adjustment of all Analog and Digital outputs through a three position switch giving the selection of Hand, Off and Auto (HOA). A HOA shall be provided for each separate digital and analog output from the controller and be an integral part of the controller. HOA switches external from the controller shall not be accepted. For the Analog outputs the Hand position of the switch shall provide for the adjustment of the output signal through a linear scaled potentiometer. The position of the HOA shall be monitored and an alarm shall be delivered to the Graphical User Interface should the switch be in an Off or Hand position. An indicating LED shall be provided on the controller for each HOA indicating position of the switch. For all Analog outputs, the indicating LED shall provide a linear indication of the position of the Potentiometer through a variation in the intensity of the indicator LED and be provided as a numerical value that can be viewed at the Graphical User Interface.
4. Enclosures – Provide for an enclosure with a separate back plate with terminals such that the electronic portion of the controller can be easily removed for ease of installation and servicing.
5. LCD Display at Boiler Plant, Chilled Water Plant Controller – Provide a wall mounted and or controler mounted easy to operate User Interface that provides direct read / write access to any point on the network. The LCD Display shall provide the following:
    1. The Display User access shall be through a simple to use directional and entry buttons or a full keyboards.
    2. Ability change temperature values. Implement temporary overrides and command equipment on and off.
    3. Two levels of user access protected by a password. Level one: View only. Level two: read and write

2.4 Configurable Controllers (CC)

A. A controller designed through its I/O configuration and configurable control logic to be used for a specific type mechanical equipment. Typical applications are VAV boxes, Fan Coil Units, Roof Top Units, Unit Ventilators, Split DX Systems, Heat Pumps etc.

B. Performance

1. Inputs: Provide software selectable universal inputs. Analog inputs - shall have the following minimum level of performance: 16 bit A to D resolution for all terminal

box applications, 12 bit A to D resolution for all other configurable applications. For VAV Applications provide a differential pressure input sensor built in to the controller with a 16 bit A to D resolution an adjustable range of 0" to 1" H_20 (0-248.8 Pa) static pressure with a minimum accuracy of ±3%. Minimum response time shall be 0.5 seconds from input to output time. **SEE PART 5 FOR ADDITIONAL REQUIREMENTS**.

2. Outputs: Analog outputs shall have the following minimum level of performance: Tri-mode Voltage of 0-10 VDC (linear), digital 0-12 VDC (off/on) or PWM. All analog outputs shall be equipped with an auto reset fuse. Output Resolution shall be a minimum 8 bits digital / analog converter. Digital outputs shall be provided with a minimum of a triac output rated at 24VAC and 1 amp. All analog outputs shall be fuse protected. **SEE PART 5 FOR ADDITIONAL REQUIREMENTS**.

C. CC Features:

1. The CC except for the VAV shall be provided with an optimum start program internal to its control logic. The optimum start shall be activated by a event signal from its associated scheduler on the network.

2. The CC shall allow the use of its spare I/O as dumb I/O to be shared over the network to other controllers such as PC or the Building Controller (BC), where a sequence of operation can be applied to the I/O. Such applications shall include but not be limited to exhaust fan control, heaters, light control, etc.

3. Enclosures – Provide for all CC except for the VAV, an enclosure with a separate back plate with terminals such that the electronic portion of the controller can be easily removed for ease of installation and servicing.

3. BAS SOFTWARE TOOLS

3.1 Controller Programming Software

A. Provide Wizards or objects that facilitate the programming and configuration of the Configurable Controllers (CC), Programmable Controller (PC) and or the Special Purpose Configurable Controllers (SPCC) sequence of operation through menu driven wizard. The programming tools shall perform the following functions:

1. PC programming shall be accomplished by graphical programming language (GPL) where objects are used to define different portions of the control sequence. All control sequences programmed into the PC shall be stored in non-volatile memory. Systems that only allow selection of sequences from a library or table are not acceptable. All code must be exportable to a library for future use.

2. CC and SPCC – Provide for the programming of the required sequence of operation through an intuitive configuration menu driven selection process. The configuration tools menu shall define items such as I/O configurations, set point, delays, PID loops, optimum start stops, and network variables settings. The configuration tool must indicate the device status and allows system override. Graphical programming language as described for the PC is acceptable.

4. USER INTERFACES

A. The system will be able to be viewed via any mobile phone or tablet

4.1 Provide for a series of browser accessible graphical screens that are resident on the BC and Server that represent the systems controllers and managed by that BC and its associated controllers.

A. The Web browser client shall support at a minimum, the following functions:

1. Unlimited concurrent users shall be able to simultaneously login without the need of any additional user licenses or fees.
2. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
3. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
4. HTML programming shall not be required to display system graphics or data on a Web page
5. Storage of the graphical screens shall be in the Building Controller (BC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
6. Real-time values displayed on a Web page shall update automatically without requiring a manual “refresh” of the Web page.
7. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
    a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
    b. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
    c. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
    d. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
    e. View logs and charts
    f. View and acknowledge alarms
8. The system shall provide the capability to specify a user’s (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

9. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

4.2 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:
    a. All points in the BAS
    b. All points in each BAS application
    c. All points in a specific controller
    d. All points in a user-defined group of points
    e. All points currently in alarm
    f. All BAS schedules
    g. All user defined and adjustable variables, schedules, interlocks and the like.
b. Reports shall be exportable to .pdf, .txt, or .csv formats.
c. The system shall allow for the creation of custom reports and queries.

2. 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:
    a. Regular schedules
    b. Repeating schedules
    c. Exception Schedules
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. Holidays and special days shall be user-selected with the pointing device or keyboard.

3. Password

a. Multiple-level password access protection shall be provided to allow the user/manager to user interface control, display, and data manipulation capabilities deemed appropriate for each user, based on an assigned password.
b. Each user shall have the following: a user name, a password, and access levels.
c. The system shall provide the capability to require a password of minimum length and require a combination of characters and numerical or special characters.
d. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.

e. The system shall provide unlimited flexibility with access rights. A minimum of four levels of access shall be provided along with the ability to customize the system to provide additional levels.
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. The system shall automatically generate a report of log-on/log-off and system activity for each user.
i. All log data shall be available in .pdf, .txt, and .csv formats.

4. Dynamic Color Graphics
   a. Provide new graphics application program as part of BAS.
   b. Graphics runtime functions –Each graphic application shall be capable of the following functions:
      a. All graphics shall be fully scalable
      b. The graphics shall support a maintained aspect ratio.
      c. Multiple fonts shall be supported.
      d. Unique background shall be assignable on a per graphic basis.
   c. Operation from graphics – It shall be possible to change values (setpoints) and states in systems controlled equipment within the Web browser interface.
   d. 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 runtime binding.
5. Thermal Floor Plans
   a. The operator interface software shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

6. Historical Data Collection
   a. All numeric, binary or data points in the system data shall allow their values to be logged over time (trend log). Each historical record shall include the point's name, a time stamp including time zone, and the point's value.
   b. The Network Area Controller (NAC) shall have the ability to store its historical data records locally and periodically to a remote server on the network (archiving).

c. The configuration of the historical data collection shall allow for recording data based on change of value or on a user-defined time interval.
d. The configuration of the historical data collection shall allow for the collection process to stop or rollover when capacity has been reached.
e. A historical data viewing utility shall be provided with access to all history records. This utility shall allow historical data to be viewed in a table or chart format.
f. The history data table view shall allow the user to hide/show columns and to filter data based on time and date. The history data table shall allow exporting to .txt, .csv, or .pdf file formats.
g. The historical data chart view shall allow different point histories to be displayed simultaneously, and also provide panning and zooming capabilities.

7. Audit Log
   a. For each log entry, provide the following data;
      a. Time and date
      b. User ID
      c. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

8. Database Backup and Storage
   a. The user shall have the ability to backup the System Controller databases.

4.3 INPUT DEVICE CHARACTERISTICS

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**
Hot Water	± .5°F.
Room Temp	± .5°F.
Duct Temperature	± .5°F.

Point Type	**Accuracy**
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 when specified:
        a. Setpoint reset slide switch providing a ±3 degree (adjustable) range.
        b. Individual heating/cooling setpoint slide switches.
        c. A momentary override request push button for activation of after-hours operation.
        d. Analog thermometer.

C. Room Command Module
    a. Room sensors shall be constructed for either surface or wall box mounting.
    b. Room sensors shall have the following capabilities:
        a. Remote Setpoint Adjustment.
        b. Three Speed Fan Selection.
        c. Override request push button with LED status for activation of after-hours operation.
        d. Cover that slides open for Service connection.

D. 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" NFT saddle and allow easy access to the sensor for repair or replacement.
    d. Thermo wells shall be constructed of 316 stainless steel.

E. 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.

F. 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.

G. Averaging Sensors

a. For ductwork greater in any dimension that 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.

H. Differential Pressure Transmitters

1. General 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 requirement of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.
2. Differential Water Pressure Applications (0” - 20” 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 flow meter differential pressure or water 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:
      a. .01-20” w.c. input differential pressure range.
      b. 4-20 mA output.
      c. Maintain accuracy up to 20 to 1 ratio turndown.
      d. Reference Accuracy: +0.2% of full span.
3. Steam or Water Pressure Applications (0” - 20” w.c.)
   a. The pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of flow meter differential pressure or water pressure sensing points.
   b. The pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
      a. .01-20” w.c. input differential pressure range.
      b. 4-20 mA output.
      c. Maintain accuracy up to 20 to 1 ratio turndown.
      d. Reference Accuracy: +0.2% of full span.

I. Smoke Detectors

1. Ionization type air duct detectors shall be furnished as specified elsewhere in Division 23 for installation under Division 26. All wiring for air duct detectors shall be provided under Division 26, Fire Alarm System.

J. Status and Safety Switches

1. General Requirements
   a. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BAS 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 Hawkeye H100, 500, 600, 800, 900 Series
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. 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.

4.4 OUTPUT DEVICE CHARACTERISTICS

A. Actuators

1. General Requirements

a. Damper and valve actuators shall be electronic and/or pneumatic, as specified in the System Description section.

B. 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.

C. 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.

D. Control Dampers

1. The BAS Contractor shall furnish all automatic dampers. All automatic dampers shall be sized for the application by the BAS Contractor or as specifically indicated on the Drawings.
2. All dampers used for throttling airflow shall be of the opposed blade type arranged for normally open or normally closed operation, as required. The damper is to be sized so that, when wide open, the pressure drop is a sufficient amount of its close-off pressure drop to shift the characteristic curve to near linear.
3. All dampers used for two-position, open/close control shall be parallel blade type arranged for normally open or closed operation, as required.
4. Damper frames and blades shall be constructed of either galvanized steel or aluminum. M4imum blade length in any section shall be 60". Damper blades shall be 16-gauge minimum and shall not exceed eight (8) inches in width. Damper frames shall be 16-gauge minimum hat channel type with corner bracing. All damper bearings shall be made of reinforced nylon, stainless steel or oil-impregnated bronze. Dampers shall be tight closing, low leakage type, with synthetic elastomer seals on the blade edges and flexible stainless steel side seals. Dampers of 48"x48" size shall not leak in excess of 8.0 cfm per square foot when closed against 4" w.g. static pressure when tested in accordance with AMCA Std. 500.
5. Airfoil blade dampers of double skin construction with linkage out of the air stream shall be used whenever the damper face velocity exceeds 1500 FPM or system pressure exceeds 2.5" w.g., but no more than 4000 FPM or 6" w.g.
6. One piece rolled blade dampers with exposed or concealed linkage may be used with face velocities of 1500 FPM or below.
7. Multiple section dampers may be jack-shafted to allow mounting of piston pneumatic actuators and direct connect electronic actuators. Each end of the jackshaft shall receive at least one actuator to reduce jackshaft twist.

E. Control Relays

1. Control Pilot Relays
   a. Control pilot relays shall be of a modular plug-in design with retaining springs or clips.
   b. Mounting bases shall be snap-mount.
   c. SPDT, DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.
   d. Contacts shall be rated for 10 amps at 120VAC.

e. Relays shall have an integral indicator light, manual override and check button or integral H-O-A switch.
f. Acceptable manufacturers: Veris Industries VMD-F Series

F. 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. Condenser 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.

G. Electronic/Pneumatic Transducers

1. Electronic to Pneumatic transducers shall provide:
   a. Output: 3-15 PSIG.
   b. Input: 4-20 mA or 0-10 VDC.
   c. Manual output adjustment.
   d. Pressure gauge.
   e. External replaceable supply air filter.

4.5 MISCELLANEOUS DEVICE CHARACTERISTICS

A. Local Control Panels

1. All control panels supplied by the BAS Contractor, without exception, shall be pre-fabricated and tested by the BAS manufacturer, incorporating the BAS manufacturer's latest design standards and layouts. All control panels shall be of steel construction, UL inspected, and listed as a UL assembly and carry the UL 508 label listing. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush latch. The BAS Contractor shall provide as part of the project submittal written verification of the BAS manufacturer's panel facility ISO9001 and UL certifications.
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 wire trough.
6. A convenience 120 VAC duplex receptacle shall be provided in each enclosure, fused on/off power switch, and required transformers.

B. Power Supplies

1. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75% of the rated capacity of the power supply.
2. Input: 120 VAC +10%, 60Hz.
3. Output: 24 VDC.
4. Line Regulation: +0.05% for 10% line change.
5. Load Regulation: +0.05% for 50% load change.
6. Ripple and Noise: 1 mV rms, 5 mV peak to peak.
7. An appropriately sized fuse and fuse block shall be provided and located next to the power supply.
8. A power disconnect switch shall be provided next to the power supply.

C. Thermostats

1. Electric room thermostats of the heavy-duty type shall be provided for unit heaters, cabinet unit heaters, and ventilation fans, where required. All these items shall be provided with concealed adjustment. Finish of covers for all room-type instruments shall match and, unless otherwise indicated or specified, covers shall be the BAS manufacturer's standard finish.

5. PART 3 - EXECUTION

5.1 BAS 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. At a minimum the contractor shall insure there are graphics depicting building floor plans, all central panels, boiler rooms, zone control, and animated 3-dimensional graphics for each unit ventilator, air handler, fan coil, etc..
2. User shall access the various system schematics via a graphical penetration scheme and/or menu selection. .

B. Actuation / Control Type

1. Unit Mounted Equipment
   a. Where control devices are indicated to be unit mounted, the BAS Contractor shall supply and ship all DDC controllers, relays, transformers, valves and damper actuators to the unit equipment manufacturer for mounting and wiring. The unit manufacturer shall mount and wire the controllers as per the BAS Contractor's control wiring diagrams and instructions.
   b. All damper and valve actuation shall be electric, spring return fail-safe and normally open or closed as specified herein.
2. Air Handling Equipment
   a. All new Air Handling Equipment shall be 100% DDC controlled.
   b. All damper and valve actuation shall be electric.

5.2 INSTALLATION PRACTICES

A. BAS Wiring

1. All conduit, wiring, accessories and wiring connections required for the installation of the Building Automation System, as herein specified, shall be provided by the BAS Contractor unless specifically shown on the Electrical Drawings under Division 26 Electrical. All wiring shall comply with the requirements of applicable portions of Division 26 and all local and national electric codes, unless specified otherwise in this section.
2. All BAS wiring materials and installation methods without exception are to comply with the following BAS manufacturers recommended installation standards.
   a. All Analog Input, Analog Output, Binary Input, Binary Output and 24VAC control cables shall be UL Plenum Rated and color coded as follows; Analog Input Cable – Yellow Jacket, Analog Output Cable – Tan Jacket, Binary Input Cable – Orange Jacket, Binary Output Cable – Violet Jacket, 24VAC Cable – Grey Jacket.
   b. All Field Bus and Ethernet LAN communications cables shall be UL Plenum Rated and be color coded as follows; Field Bus – Blue Jacket with Yellow Stripe, Ethernet LAN Cable – Violet Jacket.
   c. All Ethernet LAN communications cable be UL Plenum Rated and shall meet or exceed Category 6 rating.

3. The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BAS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BAS 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.
   c. 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.

   d. 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. BAS Line Voltage Power Source

1. 120-volt AC circuits used for the Building Automation System shall be taken from panel boards and circuit breakers provided by Division 26.
2. Circuits used for the BAS shall be dedicated to the BAS and shall not be used for any other purposes.
3. DDC terminal unit controllers may use AC power from motor power circuits.

C. BAS Raceway

1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2".
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 BAS 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. BAS 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. Cable types specified in Item A shall be color coded for easy identification and troubleshooting.

F. BAS Panel Installation

1. The BAS 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 BAS 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 BAS in accessible local control panels wherever possible.

H. HVAC Input Devices – Genera1

1. All Input devices shall be installed per the manufacturer recommendation
2. Locate components of the BAS 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. Input Flow Measuring Devices shall be installed in strict compliance with ASME guidelines affecting non-standard approach conditions.
5. 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.
6. Water Differential Pressure Sensors
   a. Differential pressure transmitters used for flow measurement shall be sized to the flow-sensing device.
   b. Differential pressure transmitters shall be supplied with tee fittings and shut-off valves in the high and low sensing pick-up lines.
   c. The transmitters shall be installed in an accessible location wherever possible.
7. 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.

8. 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.
9. 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.
10. Air Differential Pressure Status Switches:
   a. Install with static pressure tips, tubing, fittings, and air filter.
11. 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 manufacturer's 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 m4imum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke. When any pneumatic actuator is sequenced with another device, pilot positioners shall be installed to allow for proper sequencing.
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 m4imum pressure drop for water applications shall be 5 PSI. The m4imum pressure drop for steam applications shall be 2 PSI.

5.3 SCHEDULE OF RESPONSIBILITIES

A. The following schedule identifies the responsible Division for the installation of the building automation system. This schedule should be used as a general guide. The General Contractor is the central authority governing the total responsibility of all trade contractors. Therefore, deviations and clarifications of this schedule are permitted provided the General Contractor assumes responsibility to coordinate the trade contractors different than as indicated herein. If deviations or clarifications to this schedule are implemented, submit a record copy to the Architect.

Item	Furnish By	Install By	Power By	Control Wiring By

Item			Furnish By	Install By	Power By	Control Wiring By
1.	Equipment Motors		M	M	E	□
2.	Magnetic Motor Starters:					
	a.	Automatically controlled, with or without HOA switches.	E	E	E	E
	b.	Manually controlled.	E	E	E	□
	c.	Manually controlled, and which are furnished as part of factory wired equipment.	M	M	E	E
	d.	Special duty type (part winding, multi-speed, etc.)	M	See Note 1.	E	See Note 1.
	e.	Variable frequency drives with manual bypass.	SI	M	E	SI See Note 2.
	f.	Domestic booster pump. Motor Controls	M	M	E	SI
5.	General equipment disconnect switches, thermal overload switches, manual operating switches.		E	E	E	□
6.	Sprinkler system water flow and tamper switches.		M	M	E	□
7.	Outside fire alarm horn and light (at Siamese connection).		M	M	E	□
8.	Line voltage contactors.		E	E	E	E
9.	Control relay transformers (other than starters).		SI	SI	E	SI
10.	Line voltage control items such as line voltage thermostats not connected to control panel systems.		M	SI	SI	SI
11.	Loose controls and instruments furnished as part of the packaged mechanical equipment or required for operation such as valves, float controls, relays, sensors, etc.		M	M	E	—
12.	Control and Instrumentation panels		SI	SI	E	SI
13.	Automatic control valves, automatic dampers		SI	M	SI	SI

	Item	Furnish By	Install By	Power By	Control Wiring By
	and damper operators, solenoid valves, insertion temperature and pressure sensors.				
14.	Duct type fire and smoke detectors, including relays for fan shut down.	M	E	E	See Note 5.
15.	Mechanical piping heat tracing (including relays, contactors, thermostats, etc.)	M	M	E	E
16.	Emergency power off (EPO) shut down pushbutton(s) (break glass station) and controls.	SI	SI	SI	SI
17.	Control interlock wiring or software bindings between chillers, pumps and cooling towers, fans and air handling units and other miscellaneous mechanical equipment.	SI	SI	SI	SI
18.	Airflow control devices with transmitter.	SI	M	SI	SI
19.	Intelligent Devices and Control Units provided with packaged mechanical equipment such as:	M	M	E	SI
	Valve and damper operators. Fan Coil Units. Air Terminal Units. Boilers, chillers.				
20.	Intelligent Devices and Control Units provided with electrical systems such as:	E	E	E	SI
	Occupancy/motion sensors. Lighting Control Panels. Switches and Dimmers. Switch Multiplexing Control Units. Door Entry Control Units.				
21.	Gateways or interfaces for protocol conversion with a non-LONWORKS based system.	M	E	**E**	SI
22.	Routers, Bridges and Repeaters.	SI	SI	SI	SI
Abbreviations					

Item	Furnish By	Install By	Power By	Control Wiring By
Furnish.	Furnished by			
Install.	Installed by			
Power	Power Wiring Connection, Low and Medium Voltage			
SI	Systems Integrator (BAS Contractor)			
M	Mechanical Contractor			
E	Electrical Contractor			

Notes to Schedule of Responsibilities:

1. Magnetic motor starters (special duty type) shall be set in place under electrical division except when part of factory wired equipment, in which case set in place under mechanical division.
2. Where a remote motor disconnect is required in addition to the one provided integral to an Variable Frequency Drive (VFD), the NI Contractor shall provide the necessary control interlock between the disconnects.
3. The System Integrator shall inform the Mechanical Contractor and the Electrical Contractor of the additional capacity required of control power transformers.
4. The Mechanical Contractor shall refer to the electrical specifications and plans for all power and control wiring and shall advise the Architect of any discrepancies prior to bidding. The System Integrator shall be responsible for all control wiring as outlined, whether called for by the mechanical or electrical drawings and specifications.
5. Smoke Detectors and Dampers requiring interlock with building fire alarm system shall be wired by Fire Alarm contractor. **Mechanical contractor shall coordinate with Fire Alarm contractor to ensure compatibility prior to ordering such devices.**

6.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain control systems and components.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Provide operator training on data display, alarm and status descriptors, requesting data, executing commands, calibrating and adjusting devices, resetting default values, and requesting logs. Include a minimum of 40 hours' dedicated instructor time on-site.
3. Review data in maintenance manuals. Refer to Division 1 Sections "Contract Closeout" or "Operation and Maintenance Data."
4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

6.5 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested by Owner, to adjust and calibrate components and to assist Owner's personnel in making program changes and in adjusting sensors and controls to suit actual conditions.

END OF SECTION 230900

SECTION 230993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide sequence of operations for HVAC controls in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Control sequences for HVAC systems, subsystems, and equipment.

B. The Contractor shall review the following sequences of operations, points lists, and Controls Drawings to ensure that all points, devices, and programming are included for proper operation as outlined herein. Any points, devices, work, or controls mentioned in the sequences of operations and/or shown on the Controls Drawings, but not listed on the points list, or vice versa, shall be provided without additional expense to the Owner.

C. The BAS Contractor shall be responsible for full integration between the heating and cooling plant, all associated piping and controls, and existing HVAC equipment identified for tie-in. This includes, but is not limited to, all factory controls furnished by unitary equipment manufacturers. BAS contractor shall indentify features and capabilities of all factory controllers to ensure successful communication and integration with their products and user interface.

D. With the exception of freeze protection thermostats, all temperature and humidity setpoints shall be adjustable.

E. Lead/Lag Control: For all redundant water pumps, the control system shall:
1. Alternate operation of the equipment to maintain even wear
2. Automatically start the lag equipment in the event the lead equipment fails.

1.2 DEFINITIONS

A. DDC: Direct-digital controls.

B. BAS: Building Automation System.

1.1 GRAPHICAL USER INTERFACE (GUI)

A. Operator Workstation: Display the following data:

1. Dynamic system graphics.
2. Space temperature.
3. Space relative humidity.
4. Outdoor air temperature.
5. Outdoor air relative humidity.
6. Outdoor air damper position.
7. Return air damper position.
8. RTU fan status.
9. RTU fan speed.
10. RTU supply air temperature.
11. RTU economizer status.
12. Steam control valve position (coil).
13. Steam control valve position (radiators).
14. Exhaust fan status.

B. Provide alarm limits for all temperature setpoints identified above. In addition, BAS shall pass along all common alarms from equipment possessing dedicated microprocessor controls, such as chillers, boilers, and VFDs. Common equipment alarms shall be accessible via dedicated menu or tab at GUI.

1.2 PACKAGED ROOFTOP UNITS (RTU-1)

A. Unit is intended to provide cooling and ventilation (at neutral temperature) for the space. Heating is done by existing steam radiation.

B. Fan shall run continuously during occupied periods. Outside air damper shall open to minimum position.

C. Energy recovery wheel shall operate according to factory control sequence.

D. During a call for cooling, fan shall run and factory controller shall stage compressors to maintain space temperature setpoint. Hot water control valve shall be closed.

E. When cooling is not required, unit shall operate on discharge air temperature control. Control system shall modulate steam control valve as required to maintain constant 70deg F discharge air temperatures. If space thermostat calls for heat and Stage 1 heat (steam radiation) cannot maintain setpoint for 30 minutes, control system shall gradually raise discharge air temperature using PID loop to reach setpoint. Once heating setpoint is reached, discharge air temp shall return to default value.

F. DEMAND CONTROL VENTILATION: When CO2 level in space exceeds setpoint (typ. 800 ppm), BAS shall gradually open outside air damper to bring level below setpoint. When CO2 level is within setpoint for 30 mins (adj.), damper shall gradually close. Exhaust fan/damper shall operate according to factory control sequence.

G. ECONOMIZER MODE: During a call for cooling when outdoor air enthalpy is less than return air enthalpy, system shall enter economizer mode. Factory controller shall modulate outdoor air and return dampers to maintain space temperature setpoint. Exhaust air fan/damper shall operate according to factory control sequence.

1.3 STEAM PERIMETER RADIATION

A. Steam control valves shall open during a call for heat and close when space temperature setpoint is reached.

1.4 INLINE EXHAUST FAN

A. Fan shall operate according to occupancy schedule at BAS.

SEELY PLACE ELEMENTARY SCHOOL

1.1 GRAPHICAL USER INTERFACE (GUI)

A. Operator Workstation: Display the following data:

1. Dynamic system graphics.
2. Space temperature (all).
3. Space CO2 level (all).
4. Control valve position (all).
5. RTU fan speed.
6. RTU gas valve position (all).
7. RTU compressor status (all).
8. RTU discharge air temperature (all).
9. RTU return air temperature (all).
10. RTU damper position.
11. RTU economizer status.
12. ERV damper (all).
13. ERV fan speed.
14. ERV discharge air temperature.
15. ERV return air relative humidity.
16. Condenser water pump status and speed.
17. Condenser water supply temperature.
18. Condenser water return temperature.
19. HHX compressor status (all).
20. HHX condenser water position (all).
21. Cooling tower fan status.
22. Cooling tower fan speed.
23. Outside air temperature.
24. Outside air relative humidity.

B, Provide alarm limits for all temperature setpoints identified above. In addition, BAS shall pass along all common alarms from equipment possessing dedicated microprocessor controls, such as chillers, boilers, and VFDs. Common equipment alarms shall be accessible via dedicated menu or tab at GUI.

A. Fan shall run continuously during occupied periods. Outside air damper shall open to minimum position.

B. Energy recovery wheel shall operate according to factory control sequence.

C. During a call for cooling, fan shall run factory and controller shall stage compressors to maintain space temperature setpoint. Hot water control valve shall be closed.

D. During a call for heat, factory controller shall modulate gas furnace to maintain space temperature setpoint.

E. DEMAND CONTROL VENTILATION: When CO2 level in space exceeds setpoint (typ. 800 ppm), BAS shall gradually open outside air damper to bring level below setpoint. When CO2 level is within setpoint for 30 mins (adj.), damper shall gradually close. Exhaust fan/damper shall operate according to factory control sequence.

F. ECONOMIZER MODE: During a call for cooling when outdoor air enthalpy is less than return air enthalpy, system shall enter economizer mode. Factory controller shall modulate outdoor air and return dampers to maintain space temperature setpoint. Exhaust air fan/damper shall operate according to factory control sequence.

1.2 VRF FAN COIL UNITS

A. System shall be capable of simultaneous heating and cooling. System mode shall automatically change over at individual zone thermostat.

B. During a call for cooling, factory controller shall stage compressors at heat pump to maintain space temperature setpoint.

C. During a call for heat, factory controller shall stage compressors at heat pump to maintain space temperature setpoint.

D. Units shall be capable of 'auto-changeover' from heating to cooling. System shall employ no less than a 3 deg F deadband between heating and cooling setpoints. Cooling will be disabled with cooling tower is drained and decommissioned for the season.

1.3 ENERGY RECOVERY VENTILATORS

A. ERV fan shall run according to the occupancy schedule at BAS. ERV shall run when building is occupied and stop when building is unoccupied. Motorized dampers in ERV ducts shall be open when fan is running and closed when fan stops.

B. ERV speed shall modulate based on CO2 level in return air duct. ERV shall operate at low speed under normal conditions. If CO2 level exceeds 800 ppm for 30 minutes, ERV shall modulate to high speed. When CO2 level falls below 800 ppm for 30 minutes, ERV shall return to low speed. Motorized dampers and EA and OA duct connections to ERV shall be open when unit is running and closed when unit is off.

C. DEHUMIDIFICATION SEQUENCE: When return air relative humidity exceeds 60% (adjustable), ERV discharge air temperature shall be reset to 55 degrees F. Perimeter heat control valves shall modulate in all zones served by ERV to maintain space temperature setpoint. Dehumidification sequence shall disengage when space relative humidity reaches 50%.

1.4 CONDENSER WATER CONTROL SEQUENCE

A. Condenser water pump shall start at outside air temperatures of 60 deg F and above (adjustable). Condenser water pump shall stop at outside air temperatures of 59 deg F and below (adjustable). Pump shall operate at fixed speed to achieve design water flow (gpm).

1.5 COOLING TOWER CONTROL

A. Cooling tower fan staging and speed shall be controlled based on leaving condenser water temperature measured at factory controller.
B. Cooling tower spray pump staging shall be controlled based on leaving condenser water temperature measured at factory controller.

1.6 PLATE-FRAME HEAT EXCHANGER

A. Heat exchanger control valve shall modulate open to introduce boiler water when condenser water supply temperature falls below setpoint. Valve shall close when water temperature is at or above setpoint.

1.7 ROOF EXHAUST FAN

B. Fan shall operate according to occupancy schedule at BAS.

END OF SECTION 230993

SECTION 232113

HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide hydronic piping in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1 Pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

a. Hot-water heating piping.
b. Condenser water piping.

B. Related Sections include the following:

1. Division 23 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.2 DEFINITIONS

A. PTFE: Polytetrafluoroethylene.

1.3 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Hot-Water Heating Piping: 150 psig at 200 deg F.
2. Chilled water Piping: 150 psig at 60 deg F.

1.4 SUBMITTALS

A. Product Data: For each type of the following:

1. Manufactured, preinsulated, cased piping systems. Include carrier piping, insulation type and k-value, jacket, end seals, and major components for each cased piping system.
2. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves.
3. Air control devices.
4. Chemical treatment.
5. Hydronic specialties.

B. Shop Drawings: Detail the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the

building structure. Detail location of anchors, supports, alignment guides, and expansion joints and loops.

C. Welding certificates.

D. Qualification Data: For Installer.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

G. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1.6 EXTRA MATERIALS

A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B).

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

C. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

D. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.

2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Factory-fabricated companion-flange assembly, for 150 minimum working pressure as required to suit system pressures.

E. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
3. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Calpico, Inc.
b. Lochinvar Corporation.

2. Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F .

G. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Perfection Corporation; a subsidiary of American Meter Company.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Victaulic Company of America.

2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .

2.5 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section "HVAC Instrumentation and Controls."

C. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bell & Gossett Domestic Pump; a division of ITT Industries.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig .
10. Maximum Operating Temperature: 250 deg F .

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bell & Gossett Domestic Pump; a division of ITT Industries.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.

8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

E. Diaphragm-Operated, Pressure-Reducing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Amtrol, Inc.
    b. Bell & Gossett Domestic Pump; a division of ITT Industries.
    c. Conbraco Industries, Inc.
    d. Spence Engineering Company, Inc.
    e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Low inlet-pressure check valve.
8. Inlet Strainer: Bronze or brass, removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

F. Diaphragm-Operated Safety Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Amtrol, Inc.
    b. Bell & Gossett Domestic Pump; a division of ITT Industries.
    c. Conbraco Industries, Inc.
    d. Spence Engineering Company, Inc.
    e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Wetted, Internal Work Parts: Brass and rubber.
8. Valve Seat and Stem: Noncorrosive.
9. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

2.6 AIR CONTROL DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bell & Gossett Domestic Pump; a division of ITT Industries.

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8 .
6. CWP Rating: 150 psig .
7. Maximum Operating Temperature: 225 deg F .

2.7 CHEMICAL TREATMENT

A. Bypass Chemical Feeder: Welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.

1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

B. Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling, and to sustain water characteristics recommended by heat exchanger manufacturer.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot water heating piping, aboveground, NPS 2 and smaller, shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

B. Hot water heating piping, aboveground, NPS 2-1/2 and larger, shall be the following:

1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

C. Condenser water piping, aboveground, NPS 2-1/2” and smaller, shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

D. Condenser water piping, aboveground, NPS 3” and larger, shall be the following:

1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install triple-duty valves at each pump discharge to balance flow and control flow direction.

E. Install check valves at each pump discharge and elsewhere as required to control flow direction.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

K. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

L. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

M. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

N. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

O. Install valves according to Division 23 Section "General-Duty Valves for HVAC Piping."

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

S. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Basic Mechanical Materials and Methods."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Basic Mechanical Materials and Methods."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Basic Mechanical Materials and Methods."

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Seismic restraints are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.

4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 : Maximum span, 7 feet ; minimum rod size, 1/4 inch .
2. NPS 1 : Maximum span, 7 feet ; minimum rod size, 1/4 inch .
3. NPS 1-1/2 : Maximum span, 9 feet ; minimum rod size, 3/8 inch .
4. NPS 2 : Maximum span, 10 feet ; minimum rod size, 3/8 inch.
5. NPS 2-1/2 : Maximum span, 11 feet ; minimum rod size, 3/8 inch .
6. NPS 3 : Maximum span, 12 feet ; minimum rod size, 3/8 inch .
7. NPS 4 : Maximum span, 14 feet ; minimum rod size, 1/2 inch .
8. NPS 6 : Maximum span, 17 feet ; minimum rod size, 1/2 inch .

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 : Maximum span, 5 feet ; minimum rod size, 1/4 inch .
2. NPS 1 : Maximum span, 6 feet ; minimum rod size, 1/4 inch .
3. NPS 1-1/2 : Maximum span, 8 feet ; minimum rod size, 3/8 inch .
4. NPS 2 : Maximum span, 8 feet ; minimum rod size, 3/8 inch .
5. NPS 2-1/2 : Maximum span, 9 feet ; minimum rod size, 3/8 inch .
6. NPS 3 : Maximum span, 10 feet ; minimum rod size, 3/8 inch .

3.5 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install bypass chemical feeders in each hydronic system, in upright position with top of funnel not more than 48 inches (1200 mm) above the floor. Install feeder in minimum NPS 3/4 (DN 20) bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 (DN 20) pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

3.7 EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages for HVAC Piping."

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to

pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect manual air vents at high points of system and determine if all are installed and bleed air completely.
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers and heat pumps, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232116 -

HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hydronic specialty valves.
2. Air-control devices.
3. Strainers.
4. Connectors.

B. Related Requirements:

1. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for expansion fittings and loops.
2. Section 230523.11 "Globe Valves for HVAC Piping" for specification and installation requirements for globe valves common to most piping systems.
3. Section 230523.12 "Ball Valves for HVAC Piping" for specification and installation requirements for ball valves common to most piping systems.
4. Section 230523.13 "Butterfly Valves for HVAC Piping" for specification and installation requirements for butterfly valves common to most piping systems.
5. Section 230523.14 "Check Valves for HVAC Piping" for specification and installation requirements for check valves common to most piping systems.
6. Section 230523.15 "Gate Valves for HVAC Piping" for specification and installation requirements for gate valves common to most piping systems.
7. Section 230923.11 "Control Valves" for automatic control valve and sensor specifications, installation requirements, and locations.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product:

1. Include construction details and material descriptions for hydronic piping specialties.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. Safety Valves and Pressure Vessels: Shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTY VALVES

A. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.
1. Body: Bronze or brass.
2. Disc: Glass and carbon-filled PTFE.
3. Seat: Brass.
4. Stem Seals: EPDM O-rings.
5. Diaphragm: EPT.
6. Low inlet-pressure check valve.
7. Inlet Strainer: Brass, removable without system shutdown.
8. Valve Seat and Stem: Noncorrosive.
9. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

B. Diaphragm-Operated Safety Valves: ASME labeled.
1. Body: Bronze or brass.
2. Disc: Glass and carbon-filled PTFE.
3. Seat: Brass.
4. Stem Seals: EPDM O-rings.
5. Diaphragm: EPT.
6. Wetted, Internal Work Parts: Brass and rubber.
7. Inlet Strainer: Brass, removable without system shutdown.
8. Valve Seat and Stem: Noncorrosive.
9. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

C. Automatic Flow-Control Valves:
1. Body: Brass or ferrous metal.
2. Flow Control Assembly, provide either of the following:

a. Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
b. Elastomeric Diaphragm and Polyphenylsulfone Orifice Plate: Operating ranges within 2- to 80-psig differential pressure.

3. Combination Assemblies: Include bonze or brass-alloy ball valve.
4. Identification Tag: Marked with zone identification, valve number, and flow rate.

5. Size: Same as pipe in which installed.
6. Performance: Maintain constant flow within plus or minus 10 percent regardless of system pressure fluctuations.
7. Minimum CWP Rating: 175 psig.
8. Maximum Operating Temperature: 200 deg F.

2.2 AIR-CONTROL DEVICES

A. Manual Air Vents:
1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

B. Expansion Tanks:
1. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested after taps are fabricated and shall be labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig working pressure and 250 deg F maximum operating temperature.
3. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig working pressure and 240 deg F maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
4. Gage Glass: Full height with dual manual shutoff valves, 3/4-inch-diameter gage glass, and slotted-metal glass guard.

C. In-Line Air Separators:
1. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
2. Maximum Working Pressure: Up to 175 psig.
3. Maximum Operating Temperature: Up to 300 deg F.

2.3 STRAINERS

A. Y-Pattern Strainers:
1. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: Stainless-steel, [20] [40] [60]-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 125 psig.

2.4 CONNECTORS

A. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.

D. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.

1. Install tank fittings that are shipped loose.

2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

E. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION 232116

SECTION 232123

HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Inc Work Included: Provide hydronic pumps in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Separately coupled, inline pumps.
2. Automatic condensate pumps units.

1.2 DEFINITIONS

A. Buna-N: Nitrile rubber.

B. EPT: Ethylene propylene terpolymer.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of pump. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Shop Drawings: For each pump.

1. Show pumps layout and connections.
2. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
3. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: One mechanical seal(s) for each pump.

PART 2 - PRODUCTS

2.1 INLINE PUMPS WITH ELECTRICALLY COMMUNTATED MOTORS

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 Pumps Inc.
   2. Grundfos Corp.
   3. Bell & Gossett.
   4. TACO Incorporated.

2.2 AUTOMATIC CONDENSATE PUMP UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   1. Beckett Corporation.
   2. Hartell Pumps Div.; Milton Roy Co.
   3. Little Giant Pump Co.

B. Description: Packaged units with corrosion-resistant pump, plastic tank with cover, and automatic controls. Include factory- or field-installed check valve and a 72-inch minimum, electrical power cord with plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

A. Comply with HI 1.4 and HI 2.4.

B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.

E. Comply with requirements for piping specified in Division 23 Section "Steam and Condensate Heating Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

F. Where installing piping adjacent to pump, allow space for service and maintenance.

G. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

H. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

I. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.

J. Install check valve and gate or ball valve on each condensate pump unit discharge.

K. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

L. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Perform the following startup checks for each pump before starting:
    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in the correct direction.
5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
6. Start motor.
7. Open discharge valve slowly.

3.4 DEMONSTRATION

A. Train building maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 232123

SECTION 232213

STEAM AND CONDENSATE HEATING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pipe and fittings for LP steam less than 15 psig and condensate piping.

1. Steel pipe and fittings.
2. Joining materials.

B. Related Requirements:

1. Section 232216 "Steam and Condensate Heating Piping Specialties" for strainers, flash tanks, special-duty valves, steam traps, thermostatic air vents and vacuum breakers, and steam and condensate meters.

1.2 ACTION SUBMITTALS

A. Delegated-Design Submittal:

1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
2. Locations of pipe anchors and alignment guides and expansion joints and loops.
3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with [ASME B31.1, "Power Piping,"] [and] [ASME B31.9, "Building Services Piping,"] for materials, products, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:

1. LP Steam Piping: 2 psig.
2. Condensate Piping: 250 deg F.
3. Safety-Valve-Inlet and -Outlet Piping: Equal to pressure of the piping system to which it is attached.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, plain ends, welded and seamless, Grade B, and Schedule as indicated in piping applications articles.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125, 150, and 300 as indicated in piping applications articles.

C. Cast-Iron Threaded Flanges and Flanged Fittings: ASME B16.1, Classes 125 and 250 as indicated in piping applications articles; raised ground face, and bolt holes spot faced.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

PART 3 - EXECUTION

3.1 LP STEAM PIPING APPLICATIONS

A. LP Steam Piping: Schedule 40, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.

B. Condensate Piping above Grade: Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.

C. Condensate Piping below Grade: Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.

3.2 ANCILLARY PIPING APPLICATIONS

A. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

B. Vacuum-Breaker Piping: Outlet, same as service where installed.

C. Safety-Valve-Inlet and -Outlet Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless otherwise indicated.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

K. Install drains, consisting of a tee fitting, NPS 3/4 full port-ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

L. Install steam supply piping at a minimum uniform grade of 0.2 percent downward in direction of steam flow.

M. Install condensate return piping at a minimum uniform grade of 0.4 percent downward in direction of condensate flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side down.

O. Install branch connections to mains using[mechanically formed] tee fittings in main pipe, with the branch connected to top of main pipe.

P. Install valves according to the following Sections or other Sections as needed:

1. Section 230523.11 "Globe Valves for HVAC Piping."
2. Section 230523.12 "Ball Valves for HVAC Piping."
3. Section 230523.14 "Check Valves for HVAC Piping."
4. Section 230523.15 "Gate Valves for HVAC Piping."

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install shutoff valve immediately upstream of each dielectric fitting.

T. Install strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install NPS 3/4 nipple and full port ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

U. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

V. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

W. Install drip legs at low points and natural drainage points such as ends of mains, bottoms of risers, and ahead of pressure regulators, and control valves.

1. On straight runs with no natural drainage points, install drip legs at intervals not exceeding 300 feet.
2. Size drip legs same size as main. In steam mains NPS 6 and larger, drip leg size can be reduced, but to no less than NPS 4.

X. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

Y. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

Z. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 STEAM AND CONDENSATE PIPING SPECIALTIES INSTALLATION

A. Comply with requirements in Section 232216 "Steam and Condensate Heating Piping Specialties" for installation requirements for strainers, flash tanks, special-duty valves, steam traps, thermostatic air vents and vacuum breakers, and steam and condensate meters.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic restraints in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for installation of hangers, supports, and anchor devices.

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.

D. Install hangers for steel steam supply piping and steam condensate piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping within [12 inches] <Insert dimension> of each fitting.

F. Support vertical runs of steel steam supply piping and steel steam condensate piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Size for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install traps and control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install vacuum breakers downstream from control valve, close to coil inlet connection.

E. Install a drip leg at coil outlet.

3.8 FIELD QUALITY CONTROL

A. Prepare steam and condensate piping according to [ASME B31.1, "Power Piping,"] [and] [ASME B31.9, "Building Services Piping,"] and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush system with clean water. Clean strainers.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform the following tests and inspections

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength.
3. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.

E. Prepare test and inspection reports.

END OF SECTION 232213

SECTION 232216

STEAM AND CONDENSATE HEATING PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following piping specialties for steam and condensate piping:

1. Strainers.
2. Stop-check valves.
3. Steam traps.
4. Thermostatic air vents and vacuum breakers.

B. Related Requirements:
1. Section 230923.11 "Control Valves" for automatic control valve and sensor specifications, installation requirements, and locations.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Strainer.
2. Valve.
3. Steam trap.
4. Air vent and vacuum breaker.
5. Connector.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:
   1. LP Steam Piping: 2 psig.
   2. Condensate Piping: 250 deg F.
   3. Air-Vent and Vacuum-Breaker Piping: Equal to pressure of the piping system to which it is attached.
   4. Safety-Valve-Inlet and -Outlet Piping: Equal to pressure of the piping system to which it is attached.

2.2 STRAINERS

A. Y-Pattern Strainers, Cast Iron:
   1. Body: ASTM A126, Class B cast iron, with bolted cover and bottom drain connection.
   2. End Connections: Threaded ends for strainers NPS 2 and smaller; flanged ends for strainers NPS 2-1/2 and larger.
   3. Strainer Screen: Stainless steel, 40 mesh strainer or perforated stainless steel basket.
   4. Tapped blowoff plug.
   5. CWP Rating: 250-psig working steam pressure.

2.3 STOP-CHECK VALVES

A. Stop-Check Valves:
   1. Body and Bonnet: Malleable iron.
   2. End Connections: Flanged.
   3. Disc: Cylindrical with removable liner and machined seat.
   4. Stem: Brass alloy.
   5. Operator: Outside screw and yoke with cast-iron handwheel.
   6. Packing: PTFE-impregnated packing with two-piece packing gland assembly.
   7. Pressure Class: 250.

2.4 STEAM SAFETY VALVES

A. Brass Steam Safety Valves: ASME labeled.
   1. Disc Material: Forged copper alloy.
   2. End Connections: Threaded inlet and outlet.
   3. Spring: Fully enclosed steel spring with adjustable pressure range and positive shutoff; factory set and sealed.
   4. Pressure Class: 250.
   5. Drip-Pan Elbow: Cast iron and having threaded inlet and outlet, with threads complying with ASME B1.20.1.
   6. Size and Capacity: As required for equipment according to ASME Boiler and Pressure Vessel Code.

2.5 STEAM TRAPS

A. Float and Thermostatic Steam Traps, Cast Iron:
   1. Body and Bolted Cap: ASTM A126 cast iron.
   2. End Connections: Threaded.
   3. Float Mechanism: Replaceable, stainless steel.
   4. Seat: Hardened stainless steel.
   5. Trap Type: Balanced pressure.
   6. Thermostatic Bellows: Stainless steel or monel.
   7. Thermostatic air vent capable of withstanding 45 deg F of superheat and resisting water hammer without sustaining damage.
   8. Vacuum Breaker: Thermostatic with phosphor bronze bellows, and stainless steel cage, valve, and seat.
   9. Maximum Operating Pressure: 125 psig.

2.6 THERMOSTATIC AIR VENTS AND VACUUM BREAKERS

A. Thermostatic Air Vents:
   1. Body: Cast iron, bronze, or stainless steel.
   2. End Connections: Threaded.
   3. Float, Valve, and Seat: Stainless steel.
   4. Thermostatic Element: Phosphor bronze bellows in a stainless steel cage.
   5. Pressure Rating: 125 psig.
   6. Maximum Temperature Rating: 350 deg F.

B. Vacuum Breakers:
   1. Body: Cast iron, bronze, or stainless steel.
   2. End Connections: Threaded.
   3. Sealing Ball, Retainer, Spring, and Screen: Stainless steel.
   4. O-Ring Seal: Ethylene propylene rubber.
   5. Pressure Rating: 125 psig.
   6. Maximum Temperature Rating: 350 deg F.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff duty valves at branch connections to steam supply mains, at steam supply connections to equipment, and at the outlet of steam traps.

B. Install safety valves on pressure-reducing stations and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install safety-valve discharge piping, without valves, to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

3.2 INSTALLATION OF PIPING

A. Install piping to permit valve servicing.

B. Install drains, consisting of a tee fitting, NPS 3/4 full-port ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

C. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment and elsewhere as indicated.

D. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install NPS 3/4 nipple and full-port ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

3.3 INSTALLATION OF STEAM TRAPS

A. Install steam traps in accessible locations as close as possible to connected equipment.

B. Install full-port ball valve, strainer, and union upstream from trap; install union, check valve, and full-port ball valve downstream from trap unless otherwise indicated.

3.4 INSTALLATION OF SAFETY VALVES

A. Install safety valves according to ASME B31.9, "Building Services Piping."

B. Pipe safety-valve discharge without valves to atmosphere outside the building.

C. Install drip-pan elbow fitting adjacent to safety valve and pipe drain connection to nearest floor drain.

D. Install exhaust head with drain to waste, on vents equal to or larger than NPS 2-1/2.

3.5 TERMINAL EQUIPMENT CONNECTIONS

A. Install traps and control valves in accessible locations close to connected equipment.

B. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

C. Install vacuum breakers downstream from control valve, close to coil inlet connection.

END OF SECTION 232216

SECTION 232300

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and refrigerant piping specialty.

B. Shop Drawings:

1. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
2. Show interface and spatial relationships between piping and equipment.
3. Shop Drawing Scale: 3/8” equals 1 foot.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

G. Copper Pressure-Seal Fitting for Refrigerant Piping:
1. Standard: UL 207; certified by UL for field installation. Certification as a UL-recognized component alone is unacceptable.
2. Housing: Copper.
3. O-Rings: HNBR or compatible with specific refrigerant.
4. Tools: Manufacturer's approved special tools.
5. Minimum Rated Pressure: 700 psig.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:
1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.

4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:
1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).
1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

F. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.

5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or

panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic restraints in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

D. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping within 12 inches of each fitting.

F. 58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

G.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.

d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Work Included: Provide metal ducts in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Exposed spiral duct
4. Sheet metal materials.
5. Duct liner.
6. Sealants and gaskets.
7. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
2. Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Duct Construction: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

1.3 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.

6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Welding certificates.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Nexus Inc.
c. Ward Industries, Inc.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements,

materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

F. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Lockformer.

2. Duct Size: Maximum 30 inches (750 mm) wide and up to 2-inch wg (500-Pa) pressure class.
3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 (Z275).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. PVC-Coated, Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 (Z275).
2. Minimum Thickness for Factory-Applied PVC Coating: 4 mils (0.10 mm) thick.
3. Coating Materials: Acceptable to authorities having jurisdiction for use on ducts listed and labeled by an NRTL for compliance with UL 181, Class 1.

D. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

F. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: Black.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

G. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

H. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 EXPOSED SPIRAL DUCTS

A. Dual Wall Galvanized Ductwork: Where indicated round and flat oval duct shall be fabricated with an exterior pressure shell of galvanized sheet metal with minimum G-60 coating of lock forming quality. The inner shell for pipe shall be perforated galvanized steel with 3/32” holes on 3/16” staggered centers. The inner shell for fittings shall be solid galvanized steel. The manufacturer of the dual wall duct shall have published sound data.

2.5 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.

d. Owens Corning.

2. Maximum Thermal Conductivity:

   a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F mean temperature.
   b. Johns Manville.
   c. Knauf Insulation.

3. Minimum Thermal Conductivity (R-Value): 5.80.
4. Minimum Thickness: 1-1/2 inches (38 mm).
5. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
6. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel or stainless steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).
7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

   a. Fan discharges.
   b. Intervals of lined duct preceding unlined duct.
   c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm (12.7 m/s) or where indicated.

9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. VOC: Maximum 395 g/L.
9. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive or negative.
10. Service: Indoor or outdoor.
11. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes2-Inch wg (500 Pa) and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Fasteners appropriate for construction materials to which hangers are being attached.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.7 DUCT CLEANING

A. Clean new duct systems before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.

3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Rectangular Ducts Located in the Basement or in Crawl Spaces: PVC-coated, galvanized sheet steel with thicker coating on duct exterior.

B. Supply Ducts:

1. Pressure Class: Positive 2-inch wg (500 Pa).

C. Return Ducts:

1. Pressure Class: Positive or negative 2-inch wg (500 Pa).

D. Exhaust Ducts:

1. Pressure Class: Negative 2-inch wg (500 Pa).

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

F. Liner:

1. Supply Air Ducts: Fibrous glass, Type I, 1-1/2 inches thick.
2. Return Air Ducts: Fibrous glass, Type I, 1-1/2 inches thick.
3. Exhaust Air Ducts: Fibrous glass, Type I, 1 inch thick.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

   a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
   c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

      1) Radius-to Diameter Ratio: 1.5.

   b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
   c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam or welded.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

   a. Velocity 1000 fpm or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm: Conical tap.
   c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 233300

DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide duct accessories in accordance with the Contract Documents. The “General Conditions Governing All Contracts” shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Manual volume dampers.
2. Control dampers.
3. Fire dampers.
4. Ceiling dampers.
5. Flange connectors.
6. Turning vanes.
7. Duct-mounting access doors.
8. Flexible connectors.
9. Duct accessory hardware.

B. Related Sections include the following:

1. Division 28 Section "Digital, Addressable Fire-Alarm System" for duct-mounting fire and smoke detectors.
2. Division 23 Section "HVAC Instrumentation and Controls" for damper actuators.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control damper installations.
d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
e. Duct security bars.
f. Wiring Diagrams: For power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

D. Source quality-control reports.

E. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 MANUAL VOLUME DAMPERS

A. Manufacturers:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Flexmaster U.S.A., Inc.
3. McGill AirFlow LLC.
4. METALAIRE, Inc.
5. Nailor Industries Inc.
6. Ruskin Company.
7. Trox USA Inc.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized sheet steel.
3. Blade Axles: Galvanized steel.
4. Tie Bars and Brackets: Galvanized steel.

D. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized sheet steel.
3. Blade Axles: Galvanized steel.
4. Blade Seals: Neoprene.
5. Tie Bars and Brackets: Galvanized steel.

E. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 CONTROL DAMPERS

A. Manufacturers:
1. Duro Dyne Inc.
2. Flexmaster U.S.A., Inc.
3. Greenheck Fan Corporation.
4. McGill AirFlow LLC.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Ruskin Company.
8. Vent Products Company, Inc.
9. Young Regulator Company.

B. General Description: AMCA-rated, opposed-blade design; minimum of 0.1084-inch- (2.8-mm) thick, galvanized-steel frames with holes for duct mounting; minimum of 0.0635-inch- (1.61-mm) thick, galvanized-steel damper blades with maximum blade width of 8 inches (203 mm).

1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. Provide parallel- or opposed-blade design with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg (995 Pa) when damper is being held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.5 FIRE DAMPERS

A. Manufacturers:
1. Cesco Products; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. McGill AirFlow LLC.
4. METALAIRE, Inc.
5. Nailor Industries Inc.
6. NCA Manufacturing, Inc.
7. Pottorff; a division of PCI Industries, Inc.
8. Ruskin Company.

B. Fire dampers shall be labeled according to UL 555.

C. Fire Rating: 1-1/2 hours.

D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick as indicated and of length to suit application.
2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

I. Fusible Links: Replaceable, 165 deg F (74 deg C) rated.

2.6 CEILING DAMPERS

A. Manufacturers:
1. Cesco Products; a division of Mestek, Inc.
2. McGill AirFlow LLC.
3. METALAIRE, Inc.
4. Nailor Industries Inc.
5. Ruskin Company.

B. General Description: Labeled according to UL 555C; comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

D. Blades: Galvanized sheet steel with refractory insulation.

E. Fusible Links: Replaceable, 165 deg F (74 deg C) rated.

2.7 FLANGE CONNECTORS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.8 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- (38-mm-) wide, double-vane, curved blades of galvanized sheet steel set 3/4 inch (19 mm) o.c.; support with bars perpendicular to blades set 2 inches (50 mm) o.c.; and set into vane runners suitable for duct mounting.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Duro Dyne Corp.
c. METALAIRE, Inc.
d. SEMCO Incorporated.
e. Ward Industries, Inc.; a division of Hart & Cooley, Inc

C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.9 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

1. Manufacturers:

a. American Warming and Ventilating; a division of Mestek, Inc.
b. Ductmate Industries, Inc.
c. Greenheck Fan Corporation.

d. McGill AirFlow LLC.
e. Nailor Industries Inc.
f. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Provide number of hinges and locks as follows:

a. Less Than 12 Inches Square: Secure with two sash locks.
b. Up to 18 Inches Square: Two hinges and two sash locks.
c. Up to 24 by 48 Inches: Three hinges and two compression latches.
d. Sizes 24 by 48 Inches and Larger: One additional hinge.

C. Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch thickness. Include cam latches.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Flexmaster U.S.A., Inc.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) or 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Select metal compatible with ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.11 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install fire dampers according to UL listing.

G. Connect ducts to duct silencers rigidly.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. At outdoor-air intakes and mixed-air plenums.
3. At drain pans and seals.
4. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
5. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
6. At each change in direction and at maximum 50-foot (15-m) spacing.
7. Upstream or downstream from duct silencers.
8. Control devices requiring inspection.
9. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Install the following minimum sizes for duct-mounting, rectangular access doors:

1. As shown on Mechanical Details of Drawings.
2. One-Hand or Inspection Access: 12 by 12 inches.
3. Two-Hand Access: 12 by 12 inches.
4. Head and Hand Access: 16 by 20 inches.

5. Head and Shoulders Access: 16 by 20 inches.
6. Body Access: 24 by 24 inches.
7. Body Plus Ladder Access: 24 by 24 inches.

K. Install the following minimum sizes for duct-mounting, round access doors:

1. One-Hand or Inspection Access: 12 inches in diameter.
2. Two-Hand Access: 12 inches in diameter.
3. Head and Hand Access: 18 inches in diameter.
4. Head and Shoulders Access: 18 inches in diameter.
5. Body Access: 24 inches in diameter.

L. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

N. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect diffusers to ducts directly. Flexible duct is not permitted for this project.

P. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 233423

HVAC POWER VENTILATORS

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. Inline fans.

1.3 PERFORMANCE REQUIREMENTS

A. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For unit hangars and supports 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. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
   1. Ceiling suspension assembly members.
   2. Size and location of initial access modules for acoustical tile.
   3. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.9 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
   1. Greenheck Fan Corporation.
   2. Loren Cook Company.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Steel or Aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
4. Motion Sensor: Motion detector with adjustable shutoff timer.
5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
6. Filter: Washable aluminum to fit between fan and grille.
7. Isolation: Rubber-in-shear vibration isolators.
8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.2 IN-LINE CENTRIFUGAL FANS

A. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
1. Greenheck Fan Corporation.
2. Loren Cook Company.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing,

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
3. Companion Flanges: For inlet and outlet duct connections.
4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 0513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.4 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Equipment Mounting:
1. Comply with requirements for vibration isolation and seismic control devices specified in Section 23 0548 "Vibration and Seismic Controls for HVAC."
2. Comply with requirements for vibration isolation devices specified in Section 23 0548.13 "Vibration Controls for HVAC."

C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 07 7200 "Roof Accessories" for installation of roof curbs.

D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

E. Support suspended units from structure using threaded steel rods.

F. Install units with clearances for service and maintenance.

G. Label units according to requirements specified in Section 23 0553 "Identification for HVAC Piping and Equipment."

H. Provide flexible canvas connectors at fan inlet and outlet.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 23 3300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 23 0593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 233713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Work Included: Provide diffusers, registers, and grilles in accordance with the Contract Documents.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Titus.
2. Price Industries.

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

SECTION 235700

HEAT EXCHANGERS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes plate heat exchangers.

1.3 DEFINITIONS

A. AHRI: Air-Conditioning, Heating, and Refrigeration Institute.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Base Details: Detail fabrication including anchorages and attachments to structure.

C. Delegated-Design Submittal: Details and design calculations for restraints for heat exchangers.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Equipment room, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Plate removal space.
2. Structural members to which heat exchangers will be attached.

B. Product Certificates: For each type of plate frame heat exchanger. Documentation that heat exchangers comply with "AHRI Certification Standards."

C. Source quality-control reports.

D. Field quality-control reports.

E. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For heat exchangers to include in emergency, operation, and maintenance manuals.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of heat exchangers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures.
   b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.
   a. Plate, Water Heat Exchangers:
      1) Plate-and-Frame Type: Two years.

3. Equipment shall be started, commissioned, balanced, and approved prior to commencement of warranty period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design restraints for heat exchangers.

B. Heat exchangers shall be labeled for minimum 200 PSIG operating pressure when used with Primary Low Temperature Hot Water or Primary Chilled Water.

2.2 GASKETED-PLATE HEAT EXCHANGERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alfa Laval Inc.
2. APV; a brand of SPX Corporation.
3. ITT Corporation; Bell & Gossett.

B. Configuration: Freestanding assembly consisting of frame support, top and bottom carrying and guide bars, fixed and movable end plates, tie rods, individually removable plates, and one-piece gaskets.

C. Construction: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 1.

D. Heat exchanger performance shall be AHRI Certified.

E. Frame:

1. Capacity to accommodate 20 percent additional plates.
2. Painted carbon steel with provisions for anchoring to support.

F. Top and Bottom Carrying and Guide Bars: Painted carbon steel, aluminum, or stainless steel.

1. Fabricate attachment of heat-exchanger carrying and guide bars with reinforcement strong enough to resist heat-exchanger movement during seismic event when heat-exchanger carrying and guide bars are anchored to building structure.

G. End-Plate Material: Painted carbon steel.

H. Tie Rods and Nuts: Steel or stainless steel.

I. Plate Material: Type 316 stainless steel.

J. Gasket Materials: EPDM rubber.

1. Glue: Chlorine free.

K. Piping Connections: Factory fabricated of materials compatible with heat-exchanger frame. Attach tappings to frame before testing and labeling.

1. NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
2. NPS 2-1/2 and Larger: Stud Bolt circle according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

L. Enclose plates in solid stainless-steel removable shroud.

M. Capacities and Characteristics:

1. Refer to drawings for capacities and characteristics.
2. Provide minimum 200 PSIG operating pressure.

2.3 ACCESSORIES

A. Hangers and Supports:

1. Custom, steel supports for mounting on housekeeping pad.
2. Factory or Field-fabricated steel supports to ensure both horizontal and vertical support of heat exchanger. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect heat exchangers according to ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 1. Affix ASME label.

B. Hydrostatically test heat exchangers to minimum of 1.3 times pressure rating before shipment.

C. Heat exchangers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.

B. Examine roughing-in for heat-exchanger piping to verify actual locations of piping connections before equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GASKETED-PLATE HEAT-EXCHANGER INSTALLATION

A. Install gasketed-plate heat exchanger on concrete pad as indicated on Drawings.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in other Section 232113 "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Maintain manufacturer's recommended clearances for plate removal, service, and maintenance.

C. Install piping adjacent to heat exchangers to allow space for service and maintenance of heat exchangers. Arrange piping for easy removal of heat exchangers.

D. Install shutoff valves at heat-exchanger inlet and outlet connections.

E. Install relief valves on heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor drain.

F. Install vacuum breaker at heat-exchanger steam inlet connection.

G. Install thermometer on heat-exchanger inlet and outlet piping connections. Comply with requirements for thermometers specified in Section 230519 "Meters and Gages for HVAC Piping."

H. Install pressure gages on heat-exchanger and heating-fluid piping. Comply with requirements for pressure gages specified in Section 230519 "Meters and Gages for HVAC Piping."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Heat exchanger will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 CLEANING

A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain heat exchangers.

END OF SECTION 235700

SECTION 236500

COOLING TOWERS

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. This Section includes factory assembled and tested, modular hybrid forced draft vertical discharge closed circuit coolers.

1.3 DEFINITIONS

A. CTI: Cooling Technology Institute

B. IBC: International Building Code

C. ASCE: American Society of Civil Engineers

D. SEI: Structural Engineering Institute

E. EISA: Energy Independence and Securities Act

F. PVC: Polyvinyl chloride

G. BMS: Building management system

H. FRP: Fiber-reinforced polyester

I. ECM: Electronically-commutated motor

J. VFD: Variable frequency drive

K. VSC: Variable Speed Controller

L. PFC: Power Factor Correction

M. EG: Ethylene glycol

N. PG: Propylene glycol

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, pressure drop, fan performance curves with selected points indicated, furnished specialties, and accessories.

B. Shop Drawings: Complete set of manufacturer's prints of evaporative equipment assemblies, control panels, sections and elevations. Include the following:

1. Assembled unit dimensions.

2. Weight and load distribution.

3. Center of gravity location

4. Required clearances for maintenance and operation.

5. Sizes and locations of piping and wiring connections.

6. Wiring Diagrams: For power, signal, and control wiring. Differentiate between manufacturer installed and field installed wiring.

7. Fan airflow, nameplate horsepower, brake horsepower, efficiency at full load and part load.

8. Pump flow rate, head, brake horsepower, and efficiency.

9. Electrical power requirements for each cooling tower component requiring power.

1.5 QUALITY ASSURANCE

A. Verification of Performance:

1. The thermal performance shall be certified by the Cooling Technology Institute in accordance with CTI Certification Standard STD-201RS. Lacking such certification, a field acceptance test shall be conducted within the warranty period in accordance with CTI Acceptance Test Code ATC-105, by an independent CTI Licensed Thermal Testing Agency.

2. The control panel shall be listed as UL 508A.

3. Unit Sound Performance ratings shall be tested according to the CTI ATC-128 standard. Sound ratings shall not exceed specified ratings.

B. The Evaporative Heat Rejection Equipment shall comply with the energy efficiency requirements of ASHRAE Standard 90.1.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace the following components of cooling towers that fail in materials or workmanship within specified warranty period:

1. Entire Unit: The Entire Unit shall have a comprehensive one (1) year parts warranty against defects in materials and workmanship from startup, not to exceed eighteen (18) months from date of shipment.

2. Fan, Motor, Drive System: Provide five (5) year parts warranty from date of unit shipment from factory.
   a. Fan motor(s)
   b. Fan motor Variable Speed Controller (VSC)
   c. Fan(s)
   d. Bearings
   e. Mechanical Support
   f. Sheaves
   g. Bushings
   h. Gears
   i. Drive shafts

PART 2 - PRODUCTS

2.1 MODULAR HYBRID, FORCED DRAFT, COUNTERFLOW COOLER

A. Provide a modular hybrid, forced draft counterflow cooler. It must be provided with a full controls package that provides modes to optimize water and energy savings, and eliminate any potential for spray water system freezing in cold weather climates. The entire unit and controls package shall be factory-wired and tested. The controls will be integral to unit operation with single point power connection. Provide controls to allow for future system expandability.

B. Manufacturers: Subject to compliance with requirements, provide closed circuit coolers manufactured by one of the following:

1. Baltimore Aircoil Company (BAC): Nexus Model NXF-

2. Approved Equal. Prior approval of full submittal required from engineer of record.

2.2 THERMAL PERFORMANCE

A. See project schedule and notes.

2.3 WIND AND SEISMIC

A. See equipment schedule and notes for requirements.

2.4 RIGGING AND INSTALLATION

1. The unit and controls are to be shipped fully assembled to allow for a single 'pick' installation by the rigger.

2.5 MATERIALS OF CONSTRUCTION

A. Casing and Frame:

1. Unless otherwise noted in this specification, provide all steel panels and structural members protected with a thermosetting hybrid polymer (THP) coating system. Type 304 stainless steel is considered an acceptable alternative. Uncoated G-235 galvanized steel is not acceptable.

2. The THP system will consist of G-235 hot-dip galvanized steel prepared in a four-step (clean, pre-treat, rinse, dry) process. The coating will be electrostatically applied with the THP fuse-bonded to the substrate during a thermally activated curing stage. Quality will be monitored by a 23-step quality assurance program. Other coatings must be submitted to the engineer for pre-approval. Approved equals must have undergone testing, with the criteria specified below as a minimum:

   a. When X-scribed to the steel substrate it shall be able to withstand 6000 hours of 5% salt spray per ASTM B117 without blistering, chipping, or loss of adhesion;
   b. When X-scribed to the steel substrate it shall be able to withstand 6000 hours of exposure to acidic (pH=4.0) and alkaline (pH=11.0) water solutions at 95ºF without signs of chemical attack;
   c. Withstand impact of 160 in-lbs per ASTM D2794 without fracture or delamination of the polymer layer;
   d. Withstand 6000 hours of ultraviolet radiation equivalent to 120,000 hours of noontime sun exposure without loss of functional properties;
   e. Withstand 200 thermal shock cycles between -25ºF and +180ºF without loss of adhesion or other deterioration;
   f. Withstand 6000 hours of exposure to 60 psi water jet without signs of wear or erosion.

3. Fasteners shall be protected by GM7114M coating.

(OPTIONAL): Casing and Frame:

1. Unless otherwise noted in this specification, all steel panels and structural members must be constructed of Type 304 stainless steel. Fasteners must also be constructed of stainless steel.

B. Heat-Exchanger:

1. The heat exchanger will be constructed of a highly corrosion-resistant stainless steel alloy that exceeds accelerated cyclic corrosion test standard GMW14872. Type 316 stainless steel can be provided as equivalent. Heat exchanger materials must have undergone testing, with the criteria specified below as a minimum:
   a. After 30 consecutive cycles of the following procedure the sample will have no pitting corrosion:

i. Exposure of 8 hours to an ambient climate with 40-50% relative humidity at a temperature of 77°F. During this period, a salt solution is sprayed directly on the test sample four times, allowing the specimen to dry between each spraying.
ii. Exposure of 8 hours to a water fog climate of 100% relative humidity at a temperature of 120°F.
iii. Exposure of 8 hours to air drying in a climate of less than 30% relative humidity at a temperature of 140°F.

2. Provide heat exchanger that requires no field passivation. Heat exchangers that are galvanized steel are not acceptable.

3. Provide heat exchanger with a maximum allowable working pressure of 150 psi.

4. Provide heat exchanger design tested according to UL1995.

5. Internal heat exchanger volume must not exceed volume listed on equipment schedule.

C. Collection Basin:

1. The entire cold water collection basin must be constructed of Type 304 stainless steel or higher grade.

2. The collection basin will allow no spray water to be exposed to sunlight.

3. The cold water collection basin and all of its components and accessories will be fully accessible while the unit is in operation. Proper lockout-tagout procedures must be followed when servicing electrical components. The cold water basin is to be located at work bench height from base of unit to facilitate easy inspection and maintenance.

4. Provide makeup water system that provides protection from overflowing in the event of a make-up system failure and/or power loss.

5. Provide low level alarm to protect spray pump from operating dry.

6. Provide a system with a sloped spray water collection that provides continuous turbulence of the spray water basin. A factory-supplied solids separator and factory-installed cold water basin sweeper piping system is an acceptable alternative.

7. The spray water basin volume at overflow level must not exceed ____ gallons to minimize water treatment requirements.

8. Provide factory-installed collection basin accessories:

a. Pan Strainer(s) will be all Type 304 Stainless Steel construction with large area removable perforated screens.
b. Type 304 Stainless Steel Overflow connection
c. Factory-wired and installed motorized large orifice drain valve
d. Factory-wired and installed motorized Make-up control water valves and Type 304 stainless steel connection

e. Factory-wired and installed stainless steel high and low level alarms
f. Factory-wired and installed conductivity sensor

D. Water Distribution Piping:

1. Water shall be distributed evenly over the heat exchanger by a water distribution system consisting of easily removable header and spray branches of Schedule 40 PVC pipe with large orifice, non-clog distribution nozzles. The spray branches will be removable from the front face without the need to access the top of the unit.

2. The spray branches and spray nozzles shall be held in place by snap-in elastomeric grommets, allowing quick removal of individual nozzles or complete branches for cleaning or flushing.

E. Drift Eliminators:

1. Multi-pass, Polyvinyl Chloride (PVC) with inhibitors to protect against damage caused by UV radiation, with maximum flame-spread index of 5 according to ASTM E 84.

2. Drift eliminators will be accessible and removable from the side of the unit, and shall not require any fixed access platforms or ladders from the base of the unit. Units that require drift eliminators to be removed from the top of the unit shall include access platforms, handrails, and ladders to facilitate maintenance of the drift eliminators.

3. Drift eliminators must be accessible and removable for units installed with discharge ductwork. If the drift eliminators are not removable from the side of the unit, when the unit is ducted, the manufacturer shall provide discharge ductwork provisions to allow for access to the drift eliminators.

F. Air Intake Louvers/Screens:

1. Removable galvanized steel wire mesh screens must be provided on the air inlets of the unit to prevent injury while fan is in operation.

2.6 COMPONENTS

A. Make-Up Water Valves:

1. High-flow, mechanically operated, short-stroke, slow-closing make-up valve to maintain proper water level in the collection basin.

2. Electronically operated shut-off valves on the make-up and drain line allow for periodic draining of the basin to control water quality.

B. Spray Water Basin Heater:

1. If the closed-circuit cooler will operate in freezing conditions and does not utilize a factory programmed drain down cycle, the manufacturer will supply factory-wired and installed electric basin heaters and controls for the spray water basin.

2. Cold water basin is to be fitted with copper or OPTIONAL stainless steel element, electric immersion heater(s) with a separate thermostat and low water protection device. Heaters shall be selected to maintain +40° F pan water at 0°F (-20°F) ambient temperature.

3. Electric immersion heater package shall include a factory-supplied NEMA 4x enclosure containing a magnetic contactor with a single phase 120 VAC control circuit, transformer, and main power disconnect.

C. Spray Water Pump:

1. Unit must have a factory-wired submersible spray water pump rated for continuous duty.
2. The pump will be installed in a vertical position so that water will drain from the pump when the spray system is emptied.
3. Pump motor is to be totally enclosed with protective canopy for outdoor operation.
4. The pump must have Class F insulation, UL labeling, and a minimum ingress protection of IP68.
5. Construct exterior pump casing of Type 304 stainless steel.
6. Construct pump impeller of Type 304 stainless steel.
7. The spray water pump shall have an automatic reset with thermal overload protection.

D. Fan(s):

1. Factory installed and located outside of the wet airstream in the unit.

2. Fan(s) must be constructed of an aluminum alloy designed to meet or exceed standard DIN EN 485-2, protected with an epoxy coating.

3. Fan(s) must be both statically and dynamically balanced to provide for vibration-free performance.

4. Fan(s) must be provided with a removable wire-mesh screens complying with OSHA regulations.

5. Provide fan plenum design with swing-out fan base with stainless steel hinge that allows for access and easy removal. For units with fans at the top of the unit, a davit assembly is to be provided for fan and motor maintenance and removal.

6. Balancing: Fans will have maximum residual balance as per DIN ISO 1940.

E. Fan Motor(s):

1. Fan motor(s) shall be factory installed and wired and shall be Cooling Tower Duty electronically commutated (EC) with UL and CE markings.

2. Fan motor efficiency at full load: 91%

3. Motors shall have space heaters or trickle current provision to prevent condensation inside the motor. The heater shall operate automatically from the factory and require no extra wiring.

4. Fan motor(s) will have a minimum ingress protection of IP55.

5. Fan motor(s) will have maintenance-free, permanently-lubricated, sealed ball bearings.

6. Fan motor(s) will operate with integrated commutation electronics offering high efficiency across the entire speed range and optimal acoustic performance at minimal installation expenditure.

7. Fan Motor(s) will have an integrated VSC.

8. Fan motor(s) will be thermal overload protected (TOP).

9. Fan motor(s) will have integrated PFC filter which complies with IEC 61000-3-2.

10. Fan motor(s) will have integrated phase loss protection.

11. Fan motor(s) will have external loop for alarm relay in case of lock rotor, overheating, line failure, or loss of communication.

12. Fan motor(s) are to be UL listed to UL1004 and/or UL2111, CSA C22.2 No. 77 and/or No.100. 9.

13. Fan motors will have a minimum service factor of 1.0.

14. Motor Insulation is Type F.

15. Variable-Speed Motors: Inverter-duty rated per NEMA MG-1, Section IV, "Performance Standard Applying to All Machines," Part 31, "Definite-Purpose, Inverter-Fed, Polyphase Motors."

16. De-icing/shedding: Each fan shall have automatic logic built in to de-ice/shed ice on the fan during start-up.

17. Fan Motor Speed Controller: The fan controller shall allow the user to control the fan speed the following ways:
    a. RS485 ModBus communication port with both read and write capabilities (Default).
    b. Analog Input (0-10VDC, 10-0VDC or 4-20mA

F. Fan Drive System:

1. For units not provided with factory installed and wired EC motors and for non-direct drive fan systems:
    a. Provide VFD and field wiring at no cost to the contractor.
    b. Provide a 5-year labor cost for field maintenance of the fan drive systems, including field installation, field alignments, belt replacements, or gear oil changes and oil disposal.

G. (OPTIONAL) External Process Fluid Piping on multi-module units:

1. Provide factory pre-piped powder coated black steel modular header assembly for all coil connections to allow for a single inlet and outlet connection for process fluid piping. Headers shall be designed to allow for expected thermal expansion and contraction, while allowing for field misalignment.

H. Fan System Protection

1. Provide factory-wired integral electronics within the motors that will detect upset conditions, prompting the factory-provided controls to shut down the fan motor(s) in that specific module and issue an alarm warning to alert the Operator to check the module.

2. As an acceptable substitute for the capability outlined in section 2.6 H 1, all other fan drive combinations (belt or gear drive) will include the following vibration switch(es) and controls:

   a. Enclosure: NEMA 250, Type 4X.
   b. Vibration Detection: Sensor with a field-adjustable acceleration sensitivity set point in a range of 0 to 1 g and frequency range of 0 to 3000 cycles per minute. Cooling tower manufacturer shall recommend switch set point for proper operation and protection.
   c. Provide switch(es) with manual-reset button for field connection to a BMS and hardwired connection to fan motor electrical circuit.
   d. Switch(es) will, on sensing excessive vibration, signal an alarm through the BMS and shut down the fan.

PART 3 – WATER AND ENERGY CONSERVATION CONTROL SYSTEM FOR THE CLOSED CIRCUIT COOLER

3.1 GENERAL

A. Scope: The Closed Circuit Cooler Manufacturer shall furnish an industrial control panel for use with the specified closed circuit cooler. The panel must be integral to the unit's operation.

B. Terminology
   1. UI – User Interface
   2. PLC – Programmable Logic Controller
   3. BAS – Building Automation System
   4. NCDC – National Climatic Data Center
   5. VFD – Variable Frequency Drive
   6. VSC – Variable Speed Controller
   7. I/O – Input(s)/Output(s)
   8. SCCR – Short Circuit Current Rating

   The Closed Circuit Cooler Manufacturer shall not be responsible for field wiring between the control panel and field devices or between the control panel(s) and the BAS as indicated by the drawings. Wiring for power and communication to BAS is by others.

C. Device Description

The closed circuit cooler control system will control all motor driven and optional electrically operated equipment including (but not limited to) the fan motor(s), pump motor(s), basin heater(s), vibration switch(es), conductivity controller(s), make-up and drain valve(s), and manufacturer supplied water level switches. The operation of all driven components must be manually overridden for equipment startup or troubleshooting. The status of all equipment must be available to be displayed on a panel mounted user interface.

D. Submittals and Operations Manuals

1. Submittals shall include the following as a minimum:
   a. System design information sheet.
   b. Description of system operation.
   c. Control panel drawing with list of operator interfaces.
   d. Electrical power and control-wiring diagrams for customer connections.
   e. Name and address of factory trained Service Company.
   f. Submittals, which are not job specific and designed to meet the requirements of this section, will not be acceptable.
   g. Provide an electronic copy of the submittal to the consulting engineer for approval.
   h. Provide an electronic copy of the Operation and Maintenance Manual prior to system start-up.

E. Electrical

1. General

   a. No wire splicing will be permitted in cable ducts or anywhere in a panel except on identified terminal blocks.
   b. Wiring must be landed to individual terminals, as indicated on the drawings.
   c. Wires are to be labeled at each end for identification as shown on the drawings using wraparound labels.
   d. Each branch circuit in the control panel will be individually protected with either fuses or circuit breakers.

2. Wiring (Field Required)
   a. Refer to Manufacturers drawings and contract documents for all required field wiring.
   b. All discrete control wiring shall be a minimum of #14 AWG, 600 V minimum insulation and 75°C minimum temperature rating.
   c. All signal wires (i.e. 4-20 mA) shall be #18 AWG stranded copper, shielded, twisted pair unless otherwise specified.
   d. All wiring shall have the same ground reference for all connected control panels.
   e. Analog and signal wires (i.e. 4-20mA) are to be shielded individually and only grounded on the panel side.

F. Products

1. General Description

   a. Closed Circuit Cooler Control System shall be provided by the Closed Circuit Cooler Manufacturer.
   b. Closed Circuit Cooler Control System design and performance shall meet requirements specified on the attached datasheet.

2. Design Requirements
   a. The control panel manufacturer shall be listed by Underwriters Laboratories as an approved manufacturer of industrial control panels. Use of commercial grade controllers from the building automation contractor shall not be acceptable.
   b. The control panel enclosure shall meet NEMA 4x requirements.
   c. The closed circuit cooler control system shall have a Short Circuit Current Rating (SCCR) of a minimum of 65 kA at 460 VAC.
3. Control Panel will include the following equipment:
   a. Modbus and BACnet capabilities with 2-wire connection for Building Automation System (BAS)
   b. Programmable Logic Controller (PLC) with 15 percent spare I/O terminals
   c. Fluid Outlet Temperature Sensor(s) [one per unit.] Refer to contract documents for quantity and location.
   d. Ambient Dry Bulb Sensor(s) [1 per unit.] Refer to contract documents for quantity and location.
   e. Recirculating Pump Motor Starter(s)
   f. Main Circuit Breaker Disconnect
   g. Control Power Transformer
   h. High Basin Water Level Alarm Contact(s)
   i. Low Basin Water Level Alarm Contact(s)
   j. Relays, Fuses and Circuit Breakers for All Unit Equipment
   k. UI Screen
   l. Remote Access Device with cellular communication capability.
4. The following controls shall be included and integrated into control for optional accessories when provided with the Closed Circuit Cooler:
   a. Positive Closure Damper Controls
   b. Heater Package Controls with main disconnect, circuit breaker and contactor(s)
5. Circuit Breaker Disconnect
   a. Molded case circuit breaker disconnect shall provide circuit overcurrent protection with inverse time and instantaneous tripping characteristics and shall be adequately sized for all loads present in the panel enclosure. Circuit breaker shall be UL 489 Listed, CSA, IEC certified/rated and CE marked for global acceptance.
6. Branch Circuit Protection
   a. All branch circuits shall be protected by circuit breakers or fuses. Fuse holders shall be finger safe.

G. Relays
   1. Relays shall be of the plug-in base or terminal block type. Relays shall be rated for continuous duty operation.

H. User Interface (UI)
   1. Provide operator display as a stand-alone component with a separate programmable logic controller. Use of a computer for the process control will not be acceptable.
   2. The UI must be provided with a weather-tight cover mounted on the door of a NEMA 4 enclosure such that it will maintain the enclosure's NEMA 4 rating.
   3. The UI shall be industrially rated and certified for the following conditions:
      a. Relative Humidity: 5 to 95% (Non-condensing)
      b. UI shall be rated for 50,000 hours of life
      c. The UI shall be industrially rated and certified for UL/ULC.

I. Remote Access Device

1. Provide remote access device with secure access between the PLC, UI and supplier thru a private Virtual Private Network (VPN).
2. The Remote Access Device will not require a hardwired Ethernet connection to the Internet. Access will be obtained through integrated cellular connection in the control panel. The device will have the capability to use an Ethernet connection if preferred.
3. The Remote Access Device shall allow the manufacturer, with the Owner's consent, to access the control components via a cloud server on the Internet for program changes, modifications and troubleshooting if necessary.

J. Operation

1. The closed circuit cooler manufacturer shall furnish a description of the sequence of operation for the provided control system.
2. For all supported modes of operation, the panel shall utilize adaptive logic to allow for automatic adjustment between unit modes of operation based on real time system load and ambient temperature conditions.
3. Each unit shall be able to switch between the following unit modes of operation based on the customer set unit priority:
   a. Energy Saving Mode – In this mode, the modular hybrid cooler shall operate with the basin water circulation pump(s) energized and the fan motor(s) running. The fan speed will be modulated based on real time leaving water temperature and ambient conditions for maximum energy efficiency.
   b. Water Saver Mode – In Water Saver Mode, the modular hybrid cooler shall operate with the basin water circulation pump(s) de-energized and the fan motor(s) running. The fan speed shall be modulated based on real time leaving water temperature and ambient conditions for maximum water efficiency.
   c. Balanced Water and Energy Saving Mode – In this mode, the individual modules will operate wet (circulating pump energized) or dry (circulating pump de-energized) depending on the customer's setting:
      i. Customer Priority Setting – While maintaining the desired process supply water temperature, the control system will automatically operate separate modules either wet or dry based on an integral sliding scale in the controls logic. The customer will have the ability to adjust their priority of energy or water savings by choosing a value on the sliding scale.

3.2 Installation

A. All wiring to the control panel shall be installed by a licensed electrician. The National Electrical Code and all applicable state and local codes shall be followed when installing this equipment. All power, control and sensor field wiring between the control panel and the closed circuit cooler must be provided by others.

B. Control panel enclosure must be mounted to the closed circuit cooler. Separate brackets or stands are not acceptable.

3.3 Testing/Commission

A. Factory Testing

1. All inputs and outputs to the PLC must be tested for proper function at the point of field wiring.

2. The PLC and UI programs shall be tested and setup to the customer's specific job.
3. User and Factory Backups are to be saved by the manufacturer prior to shipping.

B. OPTIONAL On-Site Commissioning (By Manufacturer)
1. All VSC parameters shall be verified per the electrical drawings.
2. All field wiring between multiple control panels (if necessary) shall be verified according to best wiring practices.
3. All field wiring to remote sensors and devices shall be verified according to recommended wiring practices as detailed in manufacturer's wiring diagram.
4. Rotation of all motors shall be verified for correct direction.
5. Fan and pump motor(s) amperage shall be measured and confirmed to be within motor ratings.
6. Integration with Building Automation System (if necessary) shall be verified for correct operation and monitoring.
7. Job specific set points shall be programmed according to Customer's requirements.
8. Proper operation between the Manufacturer's supplied control system and unit shall be verified.
9. Control system shall be "tuned" for the customer's specific system.
10. Connection to the Manufacturer's remote access device shall be verified.
11. Ethernet cabling between connected components shall be tested.
12. Owner / Operator training on the system

C. Field Wiring (By Others)
1. Refer to Manufacturer's electrical drawings for all required field wiring.
2. Electrical wiring best practices shall be followed
3. All discrete control wiring shall be a minimum of #14 AWG, 600 V minimum insulation and 75°C minimum temperature rating.
4. All signal wires (i.e. 4-20 mA) shall be #18 AWG stranded copper, shielded, twisted pair unless otherwise specified.
5. All 120 VAC and 480 VAC wiring shall be run in separate conduits from 24 VAC, 4-20 mA and Ethernet wiring, with a minimum spacing of 6 inches. Conduit runs of different voltages shall cross each other at right angles to avoid electrical noise interference.
6. All field wiring shall have the same ground reference for all connected control panels.
7. VFD rated cables shall be used between the VFD in the control panel and the corresponding motor.
8. Motor leads shall be connected using approved mechanical fasteners.
9. Analog and signal wires (i.e. 4-20mA) shall be shielded individually and only grounded on the panel side.

END OF SECTION 236500

SECTION 237200

AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Packaged energy recovery ventilator (ERV)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.

   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

   1. Suspended ceiling components.
   2. Structural members to which equipment or suspension systems will be attached.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set(s) of each type of filter specified.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ARI Compliance:

1. Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."
2. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air-Cooling and Air-Heating Coils."

C. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
2. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."

D. UL Compliance:

1. Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."
2. Electric coils shall comply with requirements in UL 1995, "Heating and Cooling Equipment."

1.8 COORDINATION

A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy Recovery Units: One years.
2. Warranty Period for Energy Transfer Core: 10 years.

PART 2 - PRODUCTS

2.1 PACKAGED ENERGY RECOVERY VENTILATOR

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Oxygen 8.
2. RenewAire LLC.
3. Lossnay.

B. Unit Cabinet: Fabricated of galvanized steel, and covered with polyurethane foam insulation as necessary with steel mounting points securely attached.

C. Blowers:
1. Direct drive centrifugal blowers running simultaneously supplying and extracting air at the same rate for balanced ventilation air flow
2. The blower motors shall be a directly connected to the blower wheels and have permanently lubricated bearings

D. Heat Exchanger:
1. The enthalpic heat exchanger element shall be constructed of specially treated cellulous fiber membrane separated by corrugated layers to allow total heat (sensible and latent) energy recovery from the exhaust air to the supply air or from the supply air to the exhaust air as determined by design conditions.
2. Heat exchanger does not require condensate drain

E. Bypass Damper:
1. Automatic supply side by-pass damper to allow inbound ventilation air to by-pass the heat exchanger element when factory-installed thermistors measure outside ambient temperature being at least 7 degrees cooler than air returned from interlocked indoor units running in cooling mode
2. The mechanism for opening and closing the bypass damper shall be a 208V-230V synchronous electric motor through an actuator. The motor will drive a steel cable connected to a mechanical damper flap to allow fresh air to bypass the element

F. Air Filters: Factory installed, washable air filters located at each intake face (both supply and exhaust sides) of the heat exchanger element

2.2 CONTROLS

A. Independent control by contact closure from other sensor driven controller.

B. Electric-Coils Controls:

1. Factory-mounted sensor in unit discharge with sensor adjustment located in control panel to control electric coil to maintain temperature.
2. Wall-mounted, space-temperature sensor with temperature adjustment to control electric coil to maintain temperature.
3. Coil Controls: Multiple steps.

2.3 CAPACITIES AND CHARACTERISTICS

A. See equipment schedules on drawings for capacities and characteristics

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 237200

SECTION 237413

PACKAGED ROOFTOP HVAC EQUIPMENT

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Packaged Rooftop air conditioners

1.02 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
B. AMCA 99—Standards Handbook
C. AMCA 210—Laboratory Methods of Testing Fans for Rating Purposes
D. AMCA 500—Test Methods for Louver, Dampers, and Shutters.
E. AHRI 340/360 - Unitary Large Equipment
F. NEMA MG1—Motors and Generators
G. National Electrical Code.
H. NFPA 70—National Fire Protection Agency.
I. SMACNA—HVAC Duct Construction Standards—Metal and Flexible.
J. UL 900—Test Performance of Air Filter Units.

1.03 SUBMITTALS

A. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, electrical characteristics and connection requirements.
B. Product Data:
1. Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, and electrical characteristics and connection requirements.
2. Provide computer generated fan curves with specified operating point clearly plotted.
3. Manufacturer’s Installation Instructions.

1.04 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Provide instructions for installation, maintenance and service

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience, who issues complete catalog data on total product.
B. Startup must be done by trained personnel experienced with rooftop equipment.
C. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters and remote controls are in place, bearings lubricated, and manufacturers’ installation instructions have been followed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.
B. Accept products on site and inspect for damage.
C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

PART 2: PRODUCTS

2.01 MANUFACTURERS

A. Provide a product by one of the following:
1. Daikin Applied.
2. Trane Company.
3. Carrier Corporation.

2.02 GENERAL DESCRIPTION

A. Configuration: Fabricate as detailed on prints and drawings:
1. Return plenum / economizer section
2. Filter section
3. Cooling coil section
4. Supply fan section
5. Gas heating section.
6. Condensing unit section

B. The complete unit shall be cETLus listed.

C. The unit shall be ASHRAE 90.1-2016 compliant and labeled.

D. Each unit shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. Each unit shall be completely factory assembled and shipped in one piece. Packaged units shall be shipped fully charged with R-410 Refrigerant and oil.

E. The unit shall undergo a complete factory run test prior to shipment. The factory test shall include a refrigeration circuit run test, a unit control system operations checkout, a unit refrigerant leak test and a final unit inspection.

F. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.

G. Performance: All scheduled EER, IEER, capacities and face areas are minimum accepted values. All scheduled amps, kW, and HP are maximum accepted values that allow scheduled capacity to be met.

H. Warranty: The manufacturer shall provide standard 1-year full unit parts only warranty. The manufacturer shall provide 4-year extended compressor and 9-year gas heat exchanger parts only warranties in addition to the standard warranty. A 5-year energy recovery wheel parts only warranty shall be provided by the wheel manufacturer. Defective parts shall be repaired or replaced during the warranty period at no charge. The warranty period shall commence at startup or six months after shipment, whichever occurs first.

2.03 CABINET, CASING, AND FRAME

A. Panel construction shall be double-wall construction for all panels. All floor panels shall have a solid galvanized steel inner liner on the air stream side of the unit to protect insulation during service and maintenance. Insulation shall be a minimum of 1" thick with an R-value of 7.0, and shall be 2 part injected foam. Panel design shall include no exposed insulation edges. Unit cabinet shall be designed to operate at total static pressures up to 5.0 inches w.g.

B. Exterior surfaces shall be constructed of painted galvanized steel, for aesthetics and long-term durability. Paint finish will include a base primer with a high-quality polyester resin topcoat. Finished, unabraded panel surfaces shall be exposed to an ASTM B117 salt spray environment and exhibit no visible red rust at a minimum of 3,000 hours exposure. Finished, abraded surfaces shall be tested per ASTM D1654, having a mean scribe creepage not exceeding 1/16” at 1,000 hours minimum exposure to an ASTM B117 salt spray environment.

Measurements of results shall be quantified using ASTM D1654 in conjunction with ASTM D610 and ASTM D714 to evaluate blister and rust ratings.

C. Service doors shall be provided on the fan section, filter section, control panel section, and heating vestibule in order to provide user access to unit components. All service access doors shall be mounted on multiple, stainless steel hinges and shall be secured by a latch system. Removable service panels secured by multiple mechanical fasteners are not acceptable.

D. The unit base shall overhang the roof curb for positive water runoff and shall seat on the roof curb gasket to provide a positive, weathertight seal. Lifting brackets shall be provided on the unit base to accept cable or chain hooks for rigging the equipment.

2.04 OUTDOOR/RETURN AIR SECTION

A. Unit shall be provided with an outdoor air economizer section. The economizer section shall include outdoor, return, and exhaust air dampers. The economizer operation shall be fully integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include moisture eliminator filters to drain water away from the entering air stream. The outside and return air dampers shall be sized to handle 100% of the supply air volume. The dampers shall be parallel blade design. Damper blades shall be gasketed with side seals to provide an air leakage rate of 1.5 cfm / square foot of damper area at 1" differential pressure in according with testing defined in AMCA 500. A barometric exhaust damper shall be provided to exhaust air out of the back of the unit. A bird screen shall be provided to prevent infiltration of rain and foreign materials. Exhaust damper blades shall be lined with vinyl gasketing on contact edges. Control of the dampers shall be by a factory installed direct coupled actuator. Damper actuator shall be of the modulating, spring return type. A comparative enthalpy control shall be provided to sense and compare enthalpy in both the outdoor and return air streams to determine if outdoor air is suitable for "free" cooling. If outdoor air is suitable for "free" cooling, the outdoor air dampers shall modulate in response to the unit's temperature control system.

B. Unit shall be provided with a 100% outdoor air hood. The 100% outdoor air hood shall allow outdoor air to enter from the back of the unit, at the draw-through filter section. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include a bird screen to prevent infiltration of foreign materials and a rain lip to drain water away from the entering air stream.

C. Low leak dampers shall be provided. Damper blades shall be fully gasketed and side sealed and arranged vertically in the hood. Damper leakage shall be less than 1.5 CFM/Sq. Ft. of damper area at 1.0 inch static pressure differential. Leakage rate to be tested in accordance with AMCA Standard 500. Damper blades shall be operated from multiple sets of linkages mounted on the leaving face of the dampers. Control of the dampers shall be from a factory installed actuator.

D. Control of the outdoor dampers shall be by a factory installed actuator. Damper actuator shall be of the modulating type. Damper to open when when supply fan starts, and close when supply fan stops.

E. Provide factory installed and tested, Ebtron outdoor air monitor that controls outdoor air +/- 15% accuracy down to 40 cfm per ton.

F. Economizer assembly Fault Detection and Diagnostics (FDD) shall be 90.1, IECC compliant. MicroTech III controls shall display a warning, and write a warning to the BAS, if the economizer malfunctions in accordance with 90.1, IECC specifications.

2.05 ENERGY RECOVERY

A. The rooftop unit shall be provided with an AHRI certified rotary wheel air-to-air heat exchanger in a cassette frame complete with seals, drive motor and drive belt. The energy recovery wheel shall be an integral part of

the rooftop unit with unitary construction and does not require field assembly. Bolt-on energy recovery units that require field assembly and section to section gasketing and sealing are not acceptable.

B. The wheel capacity, air pressure drop and effectiveness shall be AHRI certified per AHRI Standard 1060. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Heat Exchangers For Energy Recovery Ventilation Equipment.

C. The rooftop unit shall be designed with a track so the entire energy recovery wheel cassette can slide out from the rooftop unit to facilitate cleaning.

D. The unit shall have 2" Merv 7 filters for the outdoor air before the wheel to help keep the wheel clean and reduce maintenance. Filter access shall be by a hinged access door with ¼ turn latches.

E. The matrix design shall have channels to reduce cross contamination between the outdoor air and the exhaust air. The layers shall be effectively captured in aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belt(s) of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.

F. The total energy recovery wheel shall be coated with silica gel desiccant permanently bonded without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity.

G. Wheels shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning.

H. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel. Wheels shall be connected to the shaft by means of taper lock hubs.

I. The exhaust air fan shall be a direct drive SWSI plenum fan. The exhaust fan shall be sized for the airflow requirements per the construction schedule. The unit controller shall control the exhaust fan to maintain building pressure. A VFD shall be provided for the exhaust fan motor or the exhaust fan motor shall be an ECM motor.The rooftop unit shall have single point electrical power connection and shall be ETL listed.

J. The control of the energy recovery wheel shall be an integral part of the rooftop unit's DDC controller. The DDC controller shall have visibility of the outdoor air temperature, leaving wheel temperature, return air temperature, and exhaust air temperature. These temperatures shall be displayed at the rooftop units DDC controller LCD display. All of these temperatures shall be made available through the BACnet interface.

K. The rooftop unit DDC controller shall provide frost control for the energy recovery wheel. When a frost condition is encountered the unit controller shall stop the wheel. When in the frost control mode the wheel shall be jogged periodically and not be allowed to stay in the stationary position.

2.06 EXHAUST FAN

A. Exhaust fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. The exhaust fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.

B. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.

C. The unit DDC controller shall provide building static pressure control. The unit controller shall provide proportional control of the exhaust fans from 25% to 100% of the supply air fan designed airflow to maintain the adjustable building pressure setpoint. The field shall mount the required sensing tubing from the building to the factory mounted building static pressure sensor.

2.07 FILTERS

A. Unit shall be provided with a draw-through filter section. The filter rack shall be designed to accept a 2" prefilter and a 4" final filter. The unit design shall have a hinged access door for the filter section. The manufacturer shall ship the rooftop unit with 2" MERV 8 and 4" MERV 14 filters.

2.08 COOLING COIL

A. The indoor coil section shall be installed in a draw through configuration, upstream of the supply air fan. The coil section shall be complete with a factory piped cooling coil and an ASHRAE 62.1 compliant double sloped drain pan.

B. The direct expansion (DX) cooling coils shall be fabricated of seamless high efficiency copper tubing that is mechanically expanded into high efficiency aluminum plate fins. Coils shall be a multi-row, staggered tube design with a minimum of 3 rows. All cooling coils shall have an interlaced coil circuiting that keeps the full coil face active at all load conditions. All coils shall be factory leak tested with high pressure air under water.

C. The cooling coil shall have an ElectroFin E-coating to protect rows and fins against corrosion. The ElectroFin coil coating is a cathodic epoxy electrode position coating formulated to provide resistance and durability to the corrosive effects of alkalis, acids, alcohols, petroleum hydrocarbons, seawater, salt air, and corrosive environments. E-coated coils are rated to withstand 6000 or more hours of salt spray according to ASTM B117 test standard.

D. The cooling coil shall have an electronic controlled expansion valve. The unit controller shall control the expansion valve to maintain liquid subcooling and the superheat of the refrigerant system.

E. The refrigerant suction lines shall be fully insulated from the expansion valve to the compressors.

F. The drain pan shall be stainless steel and positively sloped. The slope of the drain pan shall be in two directions and comply with ASHRAE Standard 62.1. The drain pan shall have a minimum slope of 1/8" per foot to provide positive draining. The drain pan shall extend beyond the leaving side of the coil. The drain pan shall have a threaded drain connection extending through the unit base.

G. A drain pan over flow safety shall shut off the unit and issue a warning before over flow occurs.

2.09 SUPPLY FAN

A. Supply fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with fan blades that are continuously welded to the hub plate and end rim. The supply fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additonal maintenance.

B. All fan assemblies shall be statically and dynamically balanced at the factory, including a final trim balance, prior to shipment.

C. Supply fan and motor assembly combinations larger than 8 hp or 22" diameter shall be internally isolated on 1" deflection, spring isolators and include removable shipping tie downs.

D. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.

E. The supply fan shall be capable of airflow modulation from 30% to 100% of the scheduled designed airflow. The fan shall not operate in a state of surge at any point within the modulation range.

2.010 VARIABLE AIR VOLUME CONTROL

A. The unit controller shall proportional control the ECM motors on the supply fan based on space temperature. The unit controller shall increase/decrease the speed of the supply fan in order to maintain the space temperature

within its setpoint and deadband. The unit controller shall provide discharge air temperature control with the compressor modulation.

2.011 HEATING SECTION

A. The rooftop unit shall include a natural gas heating section. The gas furnace design shall be one natural gas fired heating module factory installed downstream of the supply air fan in the heat section. The heating module shall be a tubular design with in-shot gas burners.

B. The module shall be complete with furnace controller and control valve capable of 10:1 modulating operation.

C. The heat exchanger tubes shall be constructed of stainless steel.

D. The module shall have an induced draft fan that will maintain a negative pressure in the heat exchanger tubes for the removal of the flue gases.

E. Each burner module shall have two flame roll-out safety protection switches and a high temperature limit switch that will shut the gas valve off upon detection of improper burner manifold operation. The induced draft fan shall have an airflow safety switch that will prevent the heating module from turning on in the event of no airflow in the flue chamber.

F. The factory-installed DDC unit control system shall control the gas heat module. Field installed heating modules shall require a field ETL certification. The manufacturer's rooftop unit ETL certification shall cover the complete unit including the gas heating modules.

2.012 CONDENSING SECTION

A. Outdoor coils shall be cast aluminum, micro-channel coils. Plate fins shall be protected and brazed between adjoining flat tubes such that they shall not extend outside the tubes. A sub-cooling coil shall be an integral part of the main outdoor air coil. Each outdoor air coil shall be factory leak tested with high-pressure air under water.

B. The condenser coil shall have an ElectroFin E-coating to protect rows and fins against corrosion. The ElectroFin coil coating is a cathodic epoxy electrode position coating formulated to provide resistance and durability to the corrosive effects of alkalis, acids, alcohols, petroleum hydrocarbons, seawater, salt air, and corrosive environments. E-coated coils are rated to withstand 6000 or more hours of salt spray according to ASTM B117 test standard.

C. Fan motors shall be an ECM type motor for proportional control. The unit controller shall proportionally control the speed of the condenser fan motors to maintain the head pressure of the refrigerant circuit from ambient condition of 25~120°F. Mechanical cooling shall be provided to 25º F. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase.

D. The condenser fan shall be low noise blade design. Fan blade design shall be a dynamic profile for low tip speed. Fan blade shall be of a composite materia

E. The unit shall have scroll compressors. One of the compressors shall be an inverter compressor providing proportional control. The unit controller shall control the speed of the compressor to maintain the discharge air temperature. The inverter compressor shall have a separate oil pump and an oil separator for each compressor that routes oil back to the compressor instead of through the discharge line.

F. Pressure transducers shall be provided for the suction pressure and head pressure. Temperature sensor shall be provided for the suction temperature and the refrigerant discharge temperature of the compressors. All of the above devices shall be an input to the unit controller and the values be displayed at the unit controller.

G. Refrigerant circuit shall have a bypass valve between the suction and discharge refrigerant lines for low head pressure compressor starting and increased compressor reliability. When there is a call for mechanical cooling

the bypass valve shall open to equalizing the suction and discharge pressures. When pressures are equalized the bypass valve shall close and the compressor shall be allowed to start.

H. Each circuit shall be dehydrated and factory charged with R-410A Refrigerant and oil. Suction and discharge isolation valves shall be provided for compressor replacement.

2.013 ELECTRICAL

A. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with the unit shall be number and color-coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a single point power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch short circuit protection, 115-volt control circuit transformer and fuse, system switches, and a high temperature sensor shall also be provided with the unit. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Supply fan motors shall have contactors and external overload protection. Knockouts shall be provided in the bottom of the main control panels for field wiring entrance.

B. A single non-fused disconnect switch shall be provided for disconnecting electrical power at the unit. Disconnect switches shall be mounted internally to the control panel and operated by an externally mounted handle.

C. A 115v service receptacle shall be provided and is to be powered separately in the field.

D. A phase voltage monitor shal be provided for protection against phase loss, phase reversal, phase unbalance, undervoltage, overvoltage, and rapid cycling

2.014 CONTROLS

A. Provide a complete integrated microprocessor based Direct Digital Control (DDC) system to control all unit functions including temperature control, scheduling, monitoring, unit safety protection, including compressor minimum run and minimum off times, and diagnostics. This system shall consist of all required temperature sensors, pressure sensors, controller and keypad/display operator interface. All MCBs and sensors shall be factory mounted, wired and tested.

B. The stand-alone DDC controllers shall not be dependent on communications with any on-site or remote PC or master control panel for proper unit operation. The microprocessor shall maintain existing set points and operate stand alone if the unit loses either direct connect or network communications. The microprocessor memory shall be protected from voltage fluctuations as well as any extended power failures. All factory and user set schedules and control points shall be maintained in nonvolatile memory. No settings shall be lost, even during extended power shutdowns.

C. The DDC control system shall permit starting and stopping of the unit locally or remotely. The control system shall be capable of providing a remote alarm indication. The unit control system shall provide for outside air damper actuation, emergency shutdown, remote heat enable/disable, remote cool enable/disable, heat indication, cool indication, and fan operation.

D. All digital inputs and outputs shall be protected against damage from transients or incorrect voltages. All field wiring shall be terminated at a separate, clearly marked terminal strip.

E. The DDC controller shall have a built-in time schedule. The schedule shall be programmable from the unit keypad interface. The schedule shall be maintained in nonvolatile memory to insure that it is not lost during a power failure. There shall be one start/stop per day and a separate holiday schedule. The controller shall accept up to sixteen holidays each with up to a 5-day duration. Each unit shall also have the ability to accept a time schedule via BAS network communications.

F. A BACnet interface card shall be provided for integration into the BMS.

G. The keypad interface shall allow convenient navigation and access to all control functions. The unit keypad/display character format shall be 4 lines x 20 characters. All control settings shall be password protected against unauthorized changes. For ease of service, the display format shall be English language readout. Coded formats with look-up tables will not be accepted. The user interaction with the display shall provide the following information as a minimum:

1. Return air temperature.
2. Discharge air temperature.
3. Outdoor air temperature.
4. Space air temperature.
5. Outdoor enthalpy, high/low.
6. Compressor suction temperature and pressure
7. Compressor head pressure and temperature
8. Expansion valve position
9. Condenser fan speed
10. Inverter compressor speed
11. Dirty filter indication.
12. Airflow verification.
13. Cooling status.
14. Control temperature (Changeover).
15. VAV box output status.
16. Cooling status/capacity.
17. Unit status.
18. All time schedules.
19. Active alarms with time and date.
20. Previous alarms with time and date.
21. Optimal start
22. Supply fan and exhaust fan speed.
23. System operating hours.
    a. Fan
    b. Exhaust fan
    c. Cooling
    d. Inndividual compressor
    e. Heating
    f. Economizer
    g. Tenant override

H. The user interaction with the keypad shall provide the following:

1. Controls mode
    a. Off manual
    b. Auto
    c. Heat/Cool
    d. Cool only
    e. Heat only
    f. Fan only
2. Occupancy mode
    a. Auto
    b. Occupied
    c. Unoccupied

d. Tenant override
3. Unit operation changeover control
a. Return air temperature
b. Space temperature
c. Network signal
4. Cooling and heating change-over temperature with deadband
5. Cooling discharge air temperature (DAT)
6. Supply reset options
a. Return air temperature
b. Outdoor air temperature
c. Space temperature
d. Airflow (VAV)
e. Network signal
f. External (0-10 vdc)
g. External (0-20 mA)
7. Temperature alarm limits
a. High supply air temperature
b. Low supply air temperature
c. High return air temperature
8. Lockout control for compressors.
9. Compressor interstage timers
10. Night setback and setup space temperature.
11. Building static pressure.
12. Economizer changeover
a. Enthalpy
b. Drybulb temperature
13. Currently time and date
14. Tenant override time
15. Occupied/unoccupied time schedule
16. One event schedule
17. Holiday dates and duration
18. Adjustable set points
19. Service mode
a. Timers normal (all time delays normal)
b. Timers fast (all time delays 20 sec)

I. If the unit is to be programmed with a night setback or setup function, an optional space sensor shall be provided. Space sensors shall be available to support field selectable features. Sensor options shall include:

1. Zone sensor with tenant override switch
2. Zone sensor with tenant override switch plus heating and cooling set point adjustment. (Space Comfort Control systems only)

J. To increase the efficiency of the cooling system the DDC controller shall include a discharge air temperature reset program for part load operating conditions. The discharge air temperature shall be controlled between a minimum and a maximum discharge air temperature (DAT) based on one of the following inputs:

1. Airflow
2. Outside air temperature
3. Space temperature
4. Return air temperature

5. External signal of 1-5 vdc
6. External signal of 0-20 mA
7. Network signal

SECTION 238129

VARIABLE-REFRIGERANT-FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes complete VRF HVAC system(s) including, but not limited to the following components to make a complete operating system(s) according to requirements indicated:

1. Indoor, concealed, high static, ceiling-mounted units for ducting.
2. Outdoor, air-source heat recovery units.
3. Heat recovery control units.
4. System controls.
5. System refrigerant and oil.
6. System condensate drain piping.
7. System refrigerant piping.
8. Metal hangers and supports.
9. Metal framing systems.
10. Fastener systems.
11. Equipment stands.
12. Miscellaneous support materials.
13. Piping and tubing insulation.
14. System control cable and raceways.

1.2 DEFINITIONS

A. Air-Conditioning System Operation: System capable of operation with all zones in cooling only.

B. Heat-Pump System Operation: System capable of operation with all zones in either heating or cooling, but not with simultaneous heating and cooling zones that transfer heat between zones.

C. Heat Recovery System Operation: System capable of operation with simultaneous heating and cooling zones that transfer heat between zones.

D. HRCU: Heat Recovery Control Unit. HRCUs are used in heat recovery VRF HVAC systems to manage and control refrigerant between indoor units to provide simultaneous heating and cooling zones. "Heat Recovery Control Unit" is the term used by ASHRAE for what different manufacturers term as branch circuit controller, branch selector box, changeover box, flow selector unit, mode change unit, and other such terms.

E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

F. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

G. Three-Pipe System Design: One high pressure refrigerant vapor line, one low pressure refrigerant vapor line, and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One liquid line and refrigerant vapor line connect HRCUs to associated indoor units.

H. Two-Pipe System Design: One refrigerant vapor line and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One refrigerant liquid line and refrigerant vapor line connect HRCUs to associated indoor units. HRCUs used in two pipe systems act as an intermediate heat exchanger and include diverting valves and gas/liquid separators to move high and low pressure refrigerant between indoor units.

I. VRF: Variable refrigerant flow.

1.3 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings: For VRF HVAC systems.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Include diagrams and details of refrigerant piping and tubing showing installation requirements for manufacturer-furnished divided flow fittings.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For fully and partially exposed indoor units with factory finishes viewable by occupants.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, sections, and details, drawn to scale, using input from installers of the items involved.

B. Qualification Data:

1. For Installer.
2. For VRF HVAC system manufacturer.
3. For VRF HVAC system provider.

C. Product Certificates: For each type of product.

D. Product test reports.

E. Source quality-control reports.

F. Field quality-control reports.

G. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On CD or DVD, USB media, or approved cloud storage platform, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 QUALITY ASSURANCE

A. Factory-Authorized Service Representative Qualifications:

1. Authorized representative of, and trained by, VRF HVAC system manufacturer.
2. In-place facility located within 75 miles of Project.
3. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.
4. Demonstrated past experience on five projects of similar complexity, scope, and value.

    a. Each person assigned to Project shall have demonstrated past experience.

5. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
6. Service and maintenance staff assigned to support Project during warranty period.
7. Product parts inventory to support ongoing system operation for a period of not less than five years after Substantial Completion.
8. VRF HVAC system manufacturer's backing to take over execution of Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by VRF HVAC system manufacturer.

1. Each employee shall be certified by manufacturer for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.

2. Installer certification shall be valid and current for duration of Project.
3. Retain copies of Installer certificates on-site and make available on request.
4. Each person assigned to Project shall have demonstrated past experience.

    a. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.
    b. Demonstrated past experience on five projects of similar complexity, scope, and value.

C. ISO Compliance: System equipment and components furnished by VRF HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period:

    a. For Compressor: Seven year(s) from date of Substantial Completion.
    b. For Parts, Including Controls: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:
1. Mitsubishi Electric & Electronic, USA
2. Daikin Applied.

2.2 SYSTEM DESCRIPTION

A. Direct-expansion (DX) VRF HVAC system(s) with variable capacity in response to varying cooling and heating loads. System shall consist of multiple indoor units, HRCUs, outdoor unit(s), piping, controls, and electrical power to make complete operating system(s) complying with requirements indicated.

1. Two-pipe or three-pipe system design.
2. System(s) operation, air-conditioning heat pump or heat recovery as indicated on Drawings.
3. Each system with one refrigerant circuit shared by all indoor units connected to system.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. AHRI Compliance: System and equipment performance certified according to AHRI 1230.

D. ASHRAE Compliance:

1. ASHRAE 15: For safety code for mechanical refrigeration.
2. ASHRAE 135: For control network protocol with remote communication.
3. ASHRAE/IES 90.1 Compliance: For system and component energy efficiency.

E. UL Compliance: Comply with UL 1995.

2.3 PERFORMANCE REQUIREMENTS

A. Service Access:

1. Provide and document service access requirements.
2. Locate equipment, system isolation valves, and other system components that require service and inspection in easily accessible locations. Avoid locations that are difficult to access if possible.
3. Where serviceable components are installed behind walls and above inaccessible ceilings, provide finished assembly with access doors or panels to gain access. Properly size the openings to allow for service, removal, and replacement.
4. If less than full and unrestricted access is provided, locate components within an 18-inch reach of the finished assembly.
5. Where ladder access is required to service elevated components, provide an installation that provides for sufficient access within ladder manufacturer's written instructions for use.
6. Comply with OSHA regulations.

B. System Design and Installation Requirements:

1. Design and install systems indicated according to manufacturer's recommendations and written instructions.
2. Where manufacturer's requirements differ from requirements indicated, contact Architect for direction. The most stringent requirements should apply unless otherwise directed in writing by Architect.

C. Isolation of Equipment: Provide isolation valves to isolate each HRCU, indoor unit and outdoor unit for service, removal, and replacement without interrupting system operation.

D. System Capacity Ratio: The sum of connected capacity of all indoor units shall be within the following range of outdoor-unit rated capacity:
1. Range acceptable to manufacturer.

E. System Turndown: Stable operation down to 20 percent of outdoor-unit capacity.

F. System Auto Refrigerant Charge: Each system shall have an automatic refrigerant charge function to ensure the proper amount of refrigerant is installed in system.

G. Outdoor Conditions:

1. Suitable for outdoor ambient conditions encountered.

a. Design equipment and supports to withstand wind loads of governing code.
b. Design equipment and supports to withstand snow and ice loads of governing code.
c. Provide corrosion-resistant coating for components and supports where located in coastal or industrial climates that are known to be harmful to materials and finishes.

2. Maximum System Operating Outdoor Temperature: 92 degrees F.
3. Minimum System Operating Outdoor Temperature: 2 degrees F.

H. Sound Performance: Sound levels generated by operating HVAC equipment shall be within requirements indicated.

1. Indoor: See Drawings.
2. Outdoor: See Drawings.

I. Thermal Movements: Allow for controlled thermal movements from ambient, surface, and system temperature changes.

J. Capacities and Characteristics: As indicated on Drawings.

2.4 INDOOR, CONCEALED, HIGH STATIC CEILING-MOUNTED UNITS FOR DUCTING

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. The unit shall have self-diagnostic function, 3-minute time delay mechanism and auto restart function.

C. Cabinet:

1. Material: Galvanized steel.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Mounting: Manufacturer-designed provisions for field installation.
5. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

D. DX Coil Assembly:

1. Coil Casing: Aluminum or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance with inner grooves for high efficiency heat exchange.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.

6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

E. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted pump or other integral lifting mechanism, capable of lifting drain water to an elevation of 27 inches above condensate pan.
3. Field Piping Connection: Non-ferrous material.

F. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion-resistant finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Auto-fan function
6. Vibration Control: Integral isolation to dampen vibration transmission.

G. Filter Assembly:

1. Separate factory fabricated filter housing with separate tracks for pre-filter and final filter.
2. See drawing schedule for filter housing and filters.

H. Unit Controls:

1. Enclosure: Metal, suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

    a. Unit inlet air temperature.
    b. Coil entering refrigerant temperature.
    c. Coil leaving refrigerant temperature.

4. Field-Customizable I/O Capability:
    a. Analog Inputs: Four for use in customizable control strategies.
    b. Digital Inputs: Four for use in customizable control strategies.
    c. Digital Outputs: Three for use in customizable control strategies.

5. Features and Functions:

    a. Self-diagnostics.
    b. Time delay.
    c. Auto-restart.
    d. External static pressure control.
    e. Auto operation mode.
    f. Manual operation mode.
    g. Filter service notification.
    h. Power consumption display.
    i. Drain assembly high water level safety shutdown and notification.
    j. Run test switch.

6. Communication: Network communication with other indoor and outdoor units.
7. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
8. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

I. Unit Electrical:

1. Enclosure: Metal, suitable for indoor locations.
2. Field Connection: Single point connection to power unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in metal raceways.

2.5 OUTDOOR, AIR-SOURCE HEAT RECOVERY UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with simultaneous heating and cooling.
2. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.
3. All units installed shall be from the same product development generation.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

    a. Coating with documented salt spray test performance of 1000 hours according ASTM B117 surface scratch test (SST) procedure.

2. Mounting: Manufacturer-designed provisions for field installation.

3. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive and turndown to 20 percent of rated capacity.
2. Protection: Integral protection against the following:

    a. High refrigerant pressure.
    b. Low oil level.
    c. High oil temperature.
    d. Thermal and overload.
    e. Voltage fluctuations.
    f. Phase failure and phase reversal.
    g. Short cycling.

3. Speed Control: Variable to automatically maintain refrigerant suction and condensing pressures while varying refrigerant flow to satisfy system cooling and heating loads.
4. Vibration Control: Integral isolation to dampen vibration transmission.
5. Oil management system to ensure safe and proper lubrication over entire operating range.
6. Crankcase heaters with integral control to maintain safe operating temperature.
7. Fusible plug.

D. Refrigerant and Refrigerant Piping:
1. R410A refrigerant shall be required for systems.
2. Polyolester (POE) oil
3. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the VRF equipment manufacturer and installed in accordance with manufacturer recommendations.
4. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.
5. Refrigerant line sizing shall be in accordance with manufacturer specifications. Future changes to indoor unit styles or sizes must be possible without resizing/replacing refrigerant piping to any other branch devices or indoor units

E. Condenser Coil Assembly:

1. Plate Fin Coils:

    a. Casing: Aluminum or stainless steel.

    b. The coil shall be protected with an integral metal guard.
    c. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
    d. Tubes: Copper, of diameter and thickness required by performance.

2. Aluminum Microchannel Coils:

a. Series of flat tubes containing a series of multiple, parallel-flow microchannels layered between refrigerant header manifolds.
b. Single- or multiple-pass arrangement.
c. Construct fins, tubes, and header manifolds of aluminum alloy.

3. Coating: Corrosion resistant.
4. Hail Protection: Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.

F. Condenser Fan and Motor Assembly:

1. Fan(s): Propeller type.

a. Direct-drive arrangement.
b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish to match performance indicated for condenser coil.
c. Statically and dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for condenser coil.
3. Motor(s): Brushless dc or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
5. Speed Settings and Control: Variable speed with a speed range of least 75 percent.
6. Vibration Control: Integral isolation to dampen vibration transmission.
7. Fans shall be capable of normal operation with a maximum of 0.24 in. WG external static pressure via dipswitch

G. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

H. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for unprotected outdoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

a. Refrigerant suction temperature.
b. Refrigerant discharge temperature.
c. Outdoor air temperature.
d. Refrigerant high pressure.
e. Refrigerant low pressure.
f. Oil level.

4. Features and Functions: Self-diagnostics, time delay, auto-restart, fuse protection, auto operation mode, manual operation mode, night setback control, equalize run time between multiple same components.
5. Communication: Network communication with indoor units and other outdoor unit(s).
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

I. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for unprotected outdoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in raceways to comply with NFPA 70.

J. Unit Hardware: Zinc-plated steel, or stainless steel. Coat exposed surfaces with additional corrosion-resistant coating if required to prevention corrosion when exposed to salt spray test for 1000 hours according ASTM B117.

2.6 HEAT RECOVERY CONTROL UNITS (HRCUs)

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with simultaneous heating and cooling.
2. Systems shall consist of one unit, or multiple unit that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.
3. Each unit shall be completely factory assembled, piped and wired, and shall be run tested at the factory.

B. Cabinet:

1. Galvanized-steel construction.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

D. Refrigeration Assemblies and Specialties:

1. Specially designed by manufacturer for type of VRF HVAC system being installed, either two or three pipe.
2. Each refrigerant branch circuit shall have refrigerant control valve(s) to control refrigerant flow.

3. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance.
4. Spares: Each heat recovery control unit shall include at least one branch circuit port(s) for future use.
5. Each system piping connection upstream of heat recovery unit shall be fitted with an isolation valve to allow for service to any heat recovery control unit in the system without interrupting operation of the system.
6. Each branch circuit connection shall be fitted with an isolation valve and capped service port to allow for service to any individual branch circuit without interrupting operation of the system.

    a. If not available as an integral part of the heat recovery control unit, isolation valves shall be field installed adjacent to the unit pipe connection.

E. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Features and Functions: Self-diagnostics, fuse protection.
4. Communication: Network communication with indoor units and outdoor unit(s).
5. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

F. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in raceways to comply with NFPA 70.

G. Unit Piping:

1. Unit Tubing: Copper tubing with brazed joints.
2. Unit Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
3. Field Piping Connections: Manufacturer's standard.
4. Factory Charge: Dehydrated air or nitrogen.
5. Testing: Factory pressure tested and verified to be without leaks.

2.7 SYSTEM CONTROLS

A. General Requirements:

1. Network: Indoor units, HRCUs, and outdoor units shall include integral controls and connect through a TIA-485A or manufacturer-selected control network.
2. Network Communication Protocol: Open control communication between interconnected units.
3. Integration with Building Automation System: ASHRAE 135, BACnet IP and certified by BACnet Testing Lab (BTL), including the following:

    a. Ethernet connection via RJ-45 connectors and port with transmission at 100 Mbps or higher.
    b. Integration shall include control, monitoring, scheduling change of value notifications.

4. Operator Interface:

    a. Operators shall interface with system and unit controls through the following:

        1) Operator interfaces integral to controllers.
        2) Owner-furnished PC connected to central controller(s).
        3) Web interface through web browser software.
        4) Integration with Building Automation System.

    b. Users shall be capable of interface with controllers for control of indoor units to extent privileges are enabled. Control features available to users shall include the following:

        1) On/off control.
        2) Temperature set-point adjustment.

B. VRF HVAC System Operator Software for PC:

1. Software offered by VRF HVAC system manufacturer shall provide system operators with ability to monitor and control VRF HVAC system(s) from a single dedicated Owner-furnished PC.
2. Software shall provide operator with a graphic user interface to allow monitoring and control of multiple central controllers from a single device location through point-and-click mouse exchange.
3. Plan views shall show building plans with location of indoor units and identification superimposed on plans.
4. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
5. Schedules operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Schedules daily, weekly, and annual events.
6. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
7. Optimized start feature to start indoor units before scheduled time to reach temperature set-point at scheduled time based on operating history.
8. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
9. Supports Imperial and Metric Temperature Units: Fahrenheit and Celsius.
10. Displays service notifications and error codes.

11. Monitors and displays up to 3000 item error history and 10000 item operation history for regular reporting and further archiving.
12. Monitors and displays cumulative operating time of indoor units.
13. Able to disable and enable operation of individual controllers for indoor units.
14. Information displayed on individual controllers shall also be available for display.
15. Information displayed for outdoor units, including refrigerant high and low pressures.

C. Central Controllers:

1. Centralized control for all indoor and outdoor units from a single central controller location.

    a. Include multiple interconnected controllers as required.

2. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
3. Schedule operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.

    a. Sets schedule for daily, weekly, and annual events.
    b. Schedule options available through central controller shall at least include the schedule options of controllers for indoor units.

4. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
5. Optimized start feature to start indoor units before scheduled time to reach temperature set-point at scheduled time based on operating history.
6. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
7. Service diagnostics tool.
8. Able to disable and enable operation of individual controllers for indoor units.
9. Information displayed on individual controllers shall also be available for display through central controller.
10. Information displayed for outdoor units, including refrigerant high and low pressures.
11. Multiple RJ-45 ports for direct connection to a local PC and an Ethernet network switch.
12. Operator interface through a backlit, high-resolution color display touch panel and web accessible through standard web browser software.

D. Wired Controllers for Indoor Units:

1. Single controller capable of controlling multiple indoor units as group.
2. Auto Timeout Touch Screen LCD: Timeout duration shall be adjustable.
3. Temperature Units: Fahrenheit and Celsius.
4. On/Off: Turns indoor unit on or off.
5. Hold: Hold operation settings until hold is released.
6. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
7. Temperature Display: 1-degree increments.
8. Temperature Set-Point: Separate set points for Cooling, Heating, and Setback. Adjustable in 1-degree increments between 50F to 85F.
9. Relative Humidity Display: 1 percent increments.

10. Relative Humidity Set-Point: Adjustable in 1 percent increments between 40% to 60%.
11. Fan Speed Setting: Select between available options furnished with the unit.
12. Airflow Direction Setting: If applicable to unit, select between available options furnished with the unit.
13. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
14. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
15. Occupancy detection.
16. Service Notification Display: "Filter".
17. Service Run Tests: Limit use by service personnel to troubleshoot operation.
18. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
19. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
20. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost. Battery backup for date and time only.
21. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

2.8 SYSTEM REFRIGERANT AND OIL

A. Refrigerant:

1. As required by VRF HVAC system manufacturer for system to comply with performance requirements indicated.
2. ASHRAE 34, Class A1 refrigerant classification.
3. R-410a.

B. Oil:

1. Polyolester (POE).

2.9 SYSTEM CONDENSATE DRAIN PIPING

A. If more than one material is listed, material selection is Contractor's option.

B. Copper Tubing:

1. Drawn-Temper Tubing: According to ASTM B88, Type L or Type DWV according to ASTM B306.
2. Wrought-Copper Fittings: ASME B16.22.
3. Wrought-Copper Unions: ASME B16.22.
4. Solder Filler Metals: ASTM B32, lead-free alloys, and water-flushable flux according to ASTM B813.

2.10 SYSTEM HYDRONIC PIPING

A. Comply with requirements in Section 232113 "Hydronic Piping" for system piping requirements.

2.11 SYSTEM REFRIGERANT PIPING

A. Refrigerant Piping:

1. Copper Tube: ASTM B280, Type ACR.
2. Wrought-Copper Fittings: ASME B16.22.
3. Brazing Filler Metals: AWS A5.8/A5.8M.

B. Refrigerant Tubing Kits:

1. Furnished by VRF HVAC system manufacturer.
2. Factory-rolled and -bundled, soft-copper tubing with tubing termination fittings at each end.
3. Standard one-piece length for connecting to indoor units.
4. Pre-insulated with flexible elastomeric insulation of thickness to comply with governing energy code and sufficient to eliminate condensation.
5. Factory Charge: Dehydrated air or nitrogen.

C. Divided-Flow Specialty Fittings: Where required by VRF HVAC system manufacturer for proper system operation, VRF HVAC system manufacturer shall furnish specialty fittings with identification and instructions for proper installation by Installer.

D. Refrigerant Isolation Ball Valves:

1. Description: Uni-body full port design, rated for maximum system temperature and pressure, and factory tested under pressure to ensure tight shutoff. Designed for valve operation without removing seal cap.
2. Seals: Compatible with system refrigerant and oil. Seal service life of at least 20 years.
3. Valve Connections: Flare or sweat depending on size.

2.12 METAL HANGERS AND SUPPORTS

A. Copper Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized or copper-coated steel.

2.13 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B-line, an Eaton business.
b. Haydon Corporation.
c. MIRO Industries.

d. Thomas & Betts Corporation; A Member of the ABB Group.
e. Unistrut; Part of Atkore International.

2. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with in-turned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel for use indoors and of stainless steel for use outdoors.
7. Metallic Coating for Use Indoors: Electroplated zinc.
8. Plastic Coating for Use Outdoors: PVC or epoxy.

2.14 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Indoor Applications: Zinc-coated or stainless steel.
2. Outdoor Applications: Stainless steel.

2.15 OUTDOOR EQUIPMENT STANDS

A. Description: Individual foot supports with elevated adjustable channel cross bars and clamps/fasteners/bolts for ground or roof-supported outdoor equipment components, without roof membrane penetration, in a prefabricated system that can be modularly assembled on-site.

B. Foot Material: Rubber or polypropylene.

C. Rails Material: Hot-dip galvanized carbon steel.

D. Wind/Sliding Load Resistance: Up to 105 mph minimum.

2.16 MISCELLANEOUS SUPPORT MATERIALS

A. Grout: ASTM C1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

B. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; galvanized.

C. Threaded Rods: Continuously threaded. Zinc-plated steel or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar material as rods.

2.17 PIPING AND TUBING INSULATION

A. Comply with requirements in Section 230719 "HVAC Piping Insulation" for system piping insulation requirements.

B. Condensate Drain Piping and Tubing Insulation and Jacket Requirements:

1. Flexible Elastomeric Insulation:

   a. Closed-cell, sponge- or expanded-rubber materials, complying with ASTM C534, Type I for tubular materials.
   b. Indoors: 1/2 inch thick.
   c. Outdoors: 1/2 inch Insert dimension thick.

2. Field-Applied Jacket:

   a. Concealed: None required.
   b. Indoors, Exposed to View: None required.
   c. Outdoors, Exposed to View: None required.

C. Refrigerant Tubing Insulation and Jacket Requirements:

1. Flexible Elastomeric Insulation:

   a. Closed-cell, sponge- or expanded-rubber materials, complying with ASTM C534, Type I for tubular materials.
   b. Indoors: 1 inch thick.
   c. Outdoors: 1 inch thick.

2. Field-Applied Jacket:

   a. Concealed: None required.
   b. Indoors, Exposed to View: None required.
   c. Outdoors, Exposed to View: Aluminum, smooth, 0.020 inch thick Insert jacket.

D. Flexible Elastomeric Insulation Adhesive: Comply with MIL-A-24179A, Type II, Class I.

E. Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.

2.18 SYSTEM CONTROL CABLE AND RACEWAYS

A. Low-Voltage Control Cabling:

1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

B. TIA-485A Network Cabling:

1. Standard Cable: NFPA 70, Type CMG.
2. Plenum-Rated Cable: NFPA 70, Type CMP.

C. Ethernet Network Cabling: TIA-568-C.2 Category 6 cable with RJ-45 connectors or as recommended by manufacturer.

D. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for control wiring and cable raceways.

2.19 MATERIALS

A. Steel:

1. ASTM A36/A36M for carbon structural steel.
2. ASTM A568/A568M for steel sheet.

B. Stainless Steel:

1. Manufacturer's standard grade for casing.
2. Manufacturer's standard type, ASTM A240/A240M for bare steel exposed to airstream or moisture.

C. Galvanized Steel: ASTM A653/A653M.

D. Aluminum: ASTM B209.

E. Comply with Section 230546 "Coatings for HVAC" for corrosion-resistant coating.

F. Corrosion-Resistant Coating: Coat with a corrosion-resistant coating capable of withstanding a 3000-hour salt-spray test according to ASTM B117.

1. Standards:

a. ASTM B117 for salt spray.
b. ASTM D2794 for minimum impact resistance of 100 in-lb.
c. ASTM B3359 for cross-hatch adhesion of 5B.

2. Application: Immersion or Spray.
3. Thickness: 1 mil.
4. Gloss: Minimum gloss of 60 on a 60-degree meter.

2.20 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect factory-assembled equipment.

B. Equipment will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports for historical record. Submit reports only if requested.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Clearance:

1. Maintain manufacturer's recommended clearances for service and maintenance.
2. Maintain clearances required by governing code.

B. Loose Components: Install components, devices, and accessories furnished by manufacturer, with equipment, that are not factory mounted.

1. Loose components shall be installed by either the manufacturer's service representative or the system Installer under supervision of manufacturer's service representative.

C. Indoor Unit Installations:

1. Install units to be level and plumb while providing a neat and finished appearance.
2. Unless otherwise required by VRF HVAC system manufacturer, support ceiling-mounted units from structure above using threaded rods; minimum rod size of 3/8 inch.
3. Adjust supports of exposed and recessed units to draw units tight to adjoining surfaces.
4. Protect finished surfaces of ceilings, floors, and walls that come in direct contact with units. Refinish or replaced damaged areas after units are installed.
5. In rooms with ceilings, conceal piping and tubing, controls, and electrical power serving units above ceilings.
6. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.
7. Provide lateral bracing if needed to limit movement of suspended units to not more than 0.25 inch.
8. For floor- and wall-mounted units that are exposed, conceal piping and tubing, controls, and electrical power serving units within walls.
9. Floor-mounted units located in mechanical rooms.
10. Install floor-mounted units on support structure indicated on Drawings.
11. Install floor-mounted units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
12. Attachment: Install hardware for proper attachment to supported equipment.
13. Grouting: Place grout under equipment supports and make bearing surface smooth.

D. Outdoor Unit Installations:

1. Install units to be level and plumb while providing a neat and finished appearance.
2. Install outdoor units on support structures indicated on Drawings.
3. Pad-Mounted Installations: Install outdoor units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

    a. Attachment: Install anchor bolts to elevations required for proper attachment to supported equipment.
    b. Grouting: Place grout under equipment supports and make bearing surface smooth.

3.2 GENERAL REQUIREMENTS FOR PIPING AND TUBING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and tubing systems. Install piping and tubing as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping and tubing above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping and tubing to permit valve servicing.

F. Install piping and tubing at slopes recommended by manufacturer.

G. Install piping and tubing free of sags.

H. Install fittings for changes in direction and branch connections.

I. Install piping and tubing to allow application of insulation.

J. Install groups of pipes and tubing parallel to each other, spaced to permit applying insulation with service access between insulated piping and tubing.

K. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

L. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors.

3.3 CONDENSATE DRAIN PIPE AND TUBING INSTALLATION

A. General Requirements for Drain Piping and Tubing:

1. Install a union in piping at each threaded unit connection.
2. Install an adjustable stainless-steel hose clamp with adjustable gear operator on unit hose connections. Tighten clamp to provide a leak-free installation.
3. If required for unit installation, provide a trap assembly in drain piping to prevent air circulated through unit from passing through drain piping. Comply with more stringent of the following:

    a. Details indicated on Drawings.
    b. Manufacturer's requirements.
    c. Governing codes.
    d. In the absence of requirements, comply with requirements of ASHRAE handbooks.

4. Extend drain piping from units with drain connections to drain receptors as indicated on Drawings. If not indicated on Drawings, terminate drain connection at nearest accessible location that is not exposed to view by occupants.
5. Provide each 90-degree change in direction with a Y- or T-fitting. Install a threaded plug connection in the dormant side of fitting or future use as a service cleanout.

B. Gravity Drains:

1. Slope piping from unit connection toward drain termination at a constant slope of not less than one percent.

C. Pumped Drains:

1. If unit condensate pump or lift mechanism is not included with an integral check valve, install a full-size check valve in each branch pipe near unit connection to prevent backflow into unit.

3.4 REFRIGERANT PIPING AND TUBING INSTALLATION

A. Refrigerant Tubing Kits:

1. Unroll and straighten tubing to suit installation. Deviations in straightness of exposed tubing shall be unnoticeable to observer.
2. Support tubing using hangers and supports indicated at intervals not to exceed 5 feet. Minimum rod size, 3/8 inch.
3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.

B. Install refrigerant piping according to ASHRAE 15 and governing codes.

C. Select system components with pressure rating equal to or greater than system operating pressure.

D. Install piping as short and direct as possible, with a minimum number of joints and fittings.

E. Arrange piping to allow inspection and service of equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels if valves or equipment requiring maintenance is concealed behind finished surfaces.

F. Install refrigerant piping and tubing in protective conduit where installed belowground.

G. Install refrigerant piping and tubing in rigid or flexible conduit in locations where exposed to mechanical damage.

H. Unless otherwise required by VRF HVAC system manufacturer, slope refrigerant piping and tubing as follows:

1. Install horizontal hot-gas discharge piping and tubing with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.

3. Install traps to entrain oil in vertical runs.
4. Liquid lines may be installed level.

I. When brazing, remove or protect components that could be damaged by heat.

J. Before installation, clean piping, tubing, and fittings to cleanliness level required by VRF HVAC system manufacturer.

K. Joint Construction:

1. Ream ends of tubes and remove burrs.
2. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
3. Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

    a. Use Type BCuP (copper-phosphorus) alloy for joining copper fittings with copper tubing.
    b. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.

3.5 PIPE AND TUBING INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated. Installation to maintain a continuous vapor barrier.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are unavailable, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

E. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof

sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.6 SOFTWARE

A. Cybersecurity:

1. Software:

a. Coordinate security requirements with Owner.
b. Ensure that latest stable software release is installed and properly operating.
c. Disable or change default passwords to password using a combination of uppercase and lower letters, numbers, and symbols at least eight characters in length. Record passwords and turn over to party responsible for system operation and administration.

2. Hardware:

a. Coordinate location and access requirements with Owner.
b. Enable highest level of wireless encryption that is compatible with Owner's ICT network.
c. Disable dual network connections.

3.7 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of manufacturer's service representative:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Refrigerant Tubing Positive Pressure Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing installation, pressurize tubing systems to a test pressure of not less than 1.5 times VRF HVAC system operating pressure, but not less than 600 psig, using dry nitrogen.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of 24 hours. Allowance for pressure changes attributed to changes in ambient temperature are acceptable.
4. Prepare test report to record the following information for each test:

    a. Name of person starting test, company name, phone number, and e-mail address.
    b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
    c. Detailed description of extent of tubing tested.
    d. Date and time at start of test.
    e. Test pressure at start of test.
    f. Outdoor temperature at start of test.
    g. Name of person ending test, company name, phone number, and e-mail address.
    h. Date and time at end of test.
    i. Test pressure at end of test.
    j. Outdoor temperature at end of test.
    k. Remarks:

5. Submit test reports for Project record.

C. Refrigerant Tubing Evacuation Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing positive-pressure testing, evacuate tubing systems to a pressure of 500 microns.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of one hour(s) with no change.
4. Prepare test report to record the following information for each test:

    a. Name of person starting test, company name, phone number, and e-mail address.
    b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
    c. Detailed description of extent of tubing tested.
    d. Date and time at start of test.
    e. Test pressure at start of test.
    f. Outdoor temperature at start of test.
    g. Name of person ending test, company name, phone number, and e-mail address.
    h. Date and time at end of test.
    i. Test pressure at end of test.
    j. Outdoor temperature at end of test.
    k. Remarks:

5. Submit test reports for Project record.
6. Upon successful completion of evacuation testing, system shall be charged with refrigerant.

D. System Refrigerant Charge:

1. Using information collected from the refrigerant tubing evacuation testing, system Installer shall consult variable refrigerant system manufacturer to determine the correct system refrigerant charge.
2. Installer shall charge system following VRF HVAC system manufacturer's written instructions.
3. System refrigerant charging shall be witnessed by system manufacturer's representative.
4. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

E. Products will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.9 STARTUP SERVICE

A. Engage a VRF HVAC system manufacturer's service representative to perform system(s) startup service.

1. Service representative shall be a factory-trained and -authorized service representative of VRF HVAC system manufacturer.
2. Complete startup service of each separate system.
3. Complete system startup service according to manufacturer's written instructions.

B. Startup checks shall include, but not be limited to, the following:

1. Check control communications of equipment and each operating component in system(s).
2. Check each indoor unit's response to demand for cooling and heating.
3. Check each indoor unit's response to changes in airflow settings.
4. Check each indoor unit, HRCU, and outdoor unit for proper condensate removal.
5. Check sound levels of each indoor and outdoor unit.

C. Installer shall accompany manufacturer's service representative during startup service and provide manufacturer's service representative with requested documentation and technical support during startup service.

1. Installer shall correct deficiencies found during startup service for reverification.

D. System Operation Report:

1. After completion of startup service, manufacturer shall issue a report for each separate system.
2. Report shall include complete documentation describing each startup check, the result, and any corrective action required.
3. Manufacturer shall electronically record not less than two hours of continuous operation of each system and submit with report for historical reference.

    a. All available system operating parameters shall be included in the information submitted.

E. Witness:

1. Invite Architect and Owner to witness startup service procedures.
2. Provide written notice not less than 20 business days before start of startup service.

3.10 ADJUSTING

A. Adjust equipment and components to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature and humidity set points. Adjust initial airflow settings and discharge airflow patterns.

C. Set field-adjustable switches and circuit-breaker trip ranges according to VRF HVAC system manufacturer's written instructions, and as indicated.

3.11 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.12 DEMONSTRATION

A. Engage a VRF HVAC system manufacturer's employed training instructor or factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain entire system.

END OF SECTION 238129

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Fire-alarm wire and cable.
4. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden Inc.
2. Encore Wire Corporation.
3. General Cable; Prysmian Group North America.
4. Southwire Company, LLC.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:

1. Type RHH and Type RHW-2: Comply with UL 44.
2. Type THHN and Type THWN-2: Comply with UL 83.
3. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
4. Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden Inc.
2. Encore Wire Corporation.
3. General Cable; Prysmian Group North America.
4. Southwire Company, LLC.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

F. Ground Conductor: Insulated.

G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Armor: Aluminum, interlocked.

I. Jacket: PVC applied over armor.

2.3 FIRE-ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Wire & Cable Inc.
2. Radix Wire.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M Electrical Products.
2. AFC Cable Systems; Atkore International.
3. Hubbell Utility Solutions; Hubbell Incorporated.
4. ILSCO.
5. Ideal Industries, Inc.
6. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
7. TE Connectivity Ltd.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

A. Comply with NFPA 72.

B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

D. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.

3.5 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

D. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm Systems" for connecting, terminating, and identifying wires and cables.

3.6 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries Inc.; Electrical Products Division, LLC.
6. Harger Lighting and Grounding.
7. ILSCO.
8. O-Z/Gedney; A Brand of the EGS Electrical Group.
9. Robbins Lighting, Inc.
10. Siemens Power Transmission & Distribution, Inc..

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

C. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. Allied Tube & Conduit; Atkore International.
c. Cooper B-line; brand of Eaton, Electrical Sector.
d. Unistrut; Atkore International.
e. Wesanco, Inc.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel.
4. Channel Width: Selected for applicable load criteria.
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti, Inc.
2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-line; brand of Eaton, Electrical Sector.
2) Empire Industries, Inc.
3) Hilti, Inc.
4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F 3125/F 3125M, Grade A325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101
3. NECA 102.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb .

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

END OF SECTION

SECTION 26 0533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Type EMT-S raceways and elbows.
2. Type ERMC-S raceways, elbows, couplings, and nipples.
3. Type LFMC raceways.
4. Fittings for conduit, tubing, and cable.
5. Metallic outlet boxes, device boxes, and covers.
6. Junction boxes, and pull boxes.
7. Cover plates for device boxes.
8. Hoods for outlet boxes.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Wireways and auxiliary gutters.
2. Surface metal raceways.
3. Floor boxes.
4. Cabinets and cutout boxes.

PART 2 - PRODUCTS

2.1 TYPE EMT-S RACEWAYS AND ELBOWS

A. Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 797 and UL Category Control Number FJMX.
2) Material: Steel.
3) Exterior Coating: Zinc.
4) Interior Coating: Zinc with organic top coating.

c. Options:

1) Minimum Trade Size: 1/2 inch.
2) Colors: As indicated on Drawings.

2.2 TYPE ERMC-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 6 and UL Category Control Number DYIX.
2) Exterior Coating: Zinc.
3) Interior Coating: Zinc with organic top coating.

c. Options:

1) Minimum Trade Size: 1/2 inch.

2.3 TYPE LFMC RACEWAYS

A. Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.

c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standard: UL 360 and UL Category Control Number DXHR.
2) Material: Steel.

c. Options:

1) Minimum Trade Size: 1/2 inch.

3. Colors: As indicated on Drawings.

2.4 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Fittings for Type ERMC:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number DWTT.
2) Material: Steel.
3) Coupling Method: Setscrew coupling. Setscrew couplings with only single screw per conduit are unacceptable.

c. Options:

1) Conduit Fittings for Hazardous (Classified) Locations: UL 1203.

2) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

B. Fittings for Type EMT Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.

2. Applicable Standards:

   a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
   b. General Characteristics:

      1) Reference Standards: UL 514B and UL Category Control Number FKAV.
      2) Material: Steel.
      3) Coupling Method: Setscrew coupling. Setscrew couplings with only single screw per conduit are unacceptable.

   c. Options:

      1) Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
      2) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

C. Fittings for Type LFMC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.

2. Applicable Standards:

   a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
   b. General Characteristics:

      1) Reference Standards: UL 514B and UL Category Control Number DXAS.

2.5 METALLIC OUTLET BOXES, DEVICE BOXES, AND COVERS

A. Metallic Outlet Boxes:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.

2. Applicable Standards:

   a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
   b. General Characteristics:

      1) Reference Standards: UL 514A and UL Category Control Number QCIT.

   c. Options:

      1) Material: Sheet steel.
      2) Sheet Metal Depth: Minimum 1.5 inch.
      3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.

B. Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.

3. Applicable Standards:

   a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
   b. General Characteristics:

      1) Reference Standards: UL 514A and UL Category Control Number QCIT.

C. Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

c. Options:

1) Material: Sheet steel.
2) Sheet Metal Depth: minimum 1.5 inch.
3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.
4) Paddle Fan Outlet Boxes and Covers: Nonadjustable, designed for attachment of paddle fan weighing up to 70 lb.

2.6 JUNCTION BOXES, AND PULL BOXES

A. Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 1.

B. Outdoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.

b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

C. Outdoor Polymeric Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

2.7 HOODS FOR OUTLET BOXES

A. Retractable or Reattachable Hoods for Outlet Boxes:

1. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
2) Receptacle, hood, cover plate, gaskets, and seals comply with UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
3) Mounts to box using fasteners different from wiring device.

c. Options:

1) Provides clear, weatherproof, "while-in-use" cover.

B. Extra-Duty, While-in-Use Hoods for Outlet Boxes:

1. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
2) Marked "Extra-Duty" in accordance with UL 514D.
3) Receptacle, hood, cover plate, gaskets, and seals comply with UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
4) Mounts to box using fasteners different from wiring device.

c. Options:

1) Provides clear, weatherproof, "while-in-use" cover.
2) Manufacturer may combine nonmetallic device box with hood as extra-duty rated assembly.

PART 3 - EXECUTION

3.1 SELECTION OF RACEWAYS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.

B. Outdoors:

1. Exposed Conduit: ERMC.
2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

C. Indoors:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
3. Damp or Wet Locations: ERMC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

D. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC: Provide threaded type fittings unless otherwise indicated.

3.2 SELECTION OF BOXES AND ENCLOSURES

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:

a. Type 3R unless otherwise indicated.

2. Indoors:

a. Type 1 unless otherwise indicated.

3.3 INSTALLATION OF RACEWAYS

A. Installation Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.
2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
3. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for hangers and supports.
4. Comply with NECA NEIS 101 for installation of steel raceways.
5. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
6. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4 inch trade size and insulated throat metal bushings on 1-1/2 inch trade size and larger conduits terminated with locknuts..
7. Raceway Terminations at Locations Subject to Moisture or Vibration:

a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG..

B. General Requirements for Installation of Raceways:

1. Complete raceway installation before starting conductor installation.
2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft. above finished floor.
3. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
4. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
5. Support conduit within 12 inch of enclosures to which attached.
6. Install raceway sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with NFPA 70.
7. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:

a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
b. Where an underground service raceway enters a building or structure.
c. Conduit extending from interior to exterior of building.
d. Conduit extending into pressurized duct and equipment.
e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
f. Where otherwise required by NFPA 70.

8. Do not install raceways or electrical items on "explosion-relief" walls or rotating equipment.
9. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
10. Keep raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
11. Cut conduit perpendicular to the length. For conduits 2 inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
12. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

C. Requirements for Installation of Specific Raceway Types:

1. Types ERMC:

a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

2. Types LFMC:

a. Comply with NEMA RV 3. Provide a maximum of 36 inch of flexible conduit forequipment subject to vibration, noise transmission, or movement; and for transformers and motors.

D. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.
1. EMT: Provide setscrew, steel fittings. Comply with NEMA FB 2.10.
2. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

3.4 INSTALLATION OF BOXES AND ENCLOSURES

A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.

B. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.

C. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.

D. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

E. Locate boxes so that cover or plate will not span different building finishes.

F. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.

G. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.

H. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.

I. Set metal floor boxes level and flush with finished floor surface.

J. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

K. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.

L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.

M. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
2. Provide gaskets for wallplates and covers.

3.5 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 8413 "Penetration Firestopping."

3.6 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.7 CLEANING

A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

END OF SECTION

SECTION 26 0544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Rectangular sleeves.
3. Sleeve seal systems.
4. Grout.
5. Pourable sealants.
6. Foam sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Wall Sleeves, Steel:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, LLC.
b. CCI Piping Systems.
c. Flexicraft Industries.
d. GPT; an EnPro Industries company.

2. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

B. Pipe Sleeves, PVC:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CCI Piping Systems.
b. GPT; an EnPro Industries company.
c. Metraflex Company (The).

2. Description: ASTM D1785, Schedule 40.

C. Sheet Metal Sleeves, Galvanized Steel, Round:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Benefast.
b. Specified Technologies, Inc.

2. Description: Galvanized-steel sheet; thickness not less than 0.0239 inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 RECTANGULAR SLEEVES

A. Sheet Metal Sleeves, Galvanized Steel, Rectangular:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Abesco Fire LLC.
b. Specified Technologies, Inc.
c. Wiremold; Legrand North America, LLC.

2. Description:

a. Material: Galvanized sheet steel.
b. Minimum Metal Thickness:

1) For sleeve cross-section rectangle perimeter less than 50 inch and with no side larger than 16 inch, thickness must be 0.052 inch.
2) For sleeve cross-section rectangle perimeter not less than 50 inch or with one or more sides larger than 16 inch, thickness must be 0.138 inch.

2.3 SLEEVE SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, LLC.
2. CALPICO, Inc.
3. Flexicraft Industries.
4. Metraflex Company (The).
5. Proco Products, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000 psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.5 POURABLE SEALANTS

A. Description: Single-component, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.6 FOAM SEALANTS

A. Description: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 9200 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve seal system is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

E. Underground, Exterior-Wall and Floor Penetrations:
1. Install steel pipe sleeves. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve seal system. Grout sleeve into wall or floor opening.

3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.

B. Install conduits and cable with no crossings within the sleeve.

C. Fill opening around conduits and cables with expanding foam without leaving voids.

D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.3 INSTALLATION OF SLEEVE SEAL SYSTEMS

A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

3. Colors for 240-V Circuits:

a. Phase A: Black.
b. Phase B: Red.

4. Colors for 480/277-V Circuits:

a. Phase A: Brown.
b. Phase B: Orange.
c. Phase C: Yellow.

5. Color for Neutral: White.
6. Color for Equipment Grounds: Green.
7. Colors for Isolated Grounds: Green two or more yellow stripes.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

E. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches for raceway and conductors.
b. 3-1/2 by 5 inches for equipment.
c. As required by authorities having jurisdiction.

2.4 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. in., minimum 1/16 inch thick.
b. For signs larger than 20 sq. in., 1/8 inch thick.
c. Engraved legend with white letters on a dark gray background.
d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

K. Vinyl Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

L. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

M. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.

N. Self-Adhesive Labels:

1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

O. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

P. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

Q. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

R. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

S. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

T. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

3.2 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

D. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 24 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

D. Enclosures: Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

2. Height: 84 inches maximum.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

E. Incoming Mains Location: Bottom.

F. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

G. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
3. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 26 2813 "Fuses."

2.4 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install panelboards and accessories according to NEMA PB 1.1.

C. Mount panelboard cabinet plumb and rigid without distortion of box.

D. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

F. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

G. Install filler plates in unused spaces.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 0553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard-grade receptacles, 125 V, 20 A.
2. GFCI receptacles, 125 V, 20 A.
3. Toggle switches, 120/277 V, 20 A.
4. Wall plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Comply with NFPA 70.

C. RoHS compliant.

D. Comply with NEMA WD 1.

E. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

F. Wall Plate Color: For plastic covers, match device color.

G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pass & Seymour/Legrand (Pass & Seymour).
2. Hubbell Incorporated; Wiring Device Kellems (Hubbell).
3. Cooper Wiring Devices; Division of Cooper Industries Inc. (Cooper).

B. Duplex Receptacles, 125 V, 20 A:

1. Description: Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498 and FS W-C-596.

C. Weather-Resistant Duplex Receptacle, 125 V, 20 A:

1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

2.3 GFCI RECEPTACLES, 125 V, 20 A

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pass & Seymour/Legrand (Pass & Seymour).
2. Hubbell Incorporated; Wiring Device Kellems (Hubbell).
3. Cooper Wiring Devices; Division of Cooper Industries Inc. (Cooper).

B. Duplex GFCI Receptacles, 125 V, 20 A:

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

C. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A:

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

D. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.

3. Type: Non-feed through.
4. Standards: Comply with UL 498 and UL 943 Class A.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.4 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
3. Install wiring devices after all wall preparation, including painting, is complete.

C. Device Installation:

1. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

D. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 5 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 26 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Nonfusible switches.
2. Molded-case circuit breakers (MCCBs).
3. Molded-case switches.
4. Enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated.

E. MCCBs shall be equipped with a device for locking in the isolated position.

F. Lugs shall be suitable for 75 deg C rated wire.

G. Standards: Comply with UL 489 with interrupting capacity to comply with available fault currents.

H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (NEMA 250 Types 3R, 12).

C. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

3.2 INSTALLATION

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Architect's written permission.
4. Comply with NFPA 70E.

B. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

C. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in fusible devices.

F. Comply with NFPA 70 and NECA 1.

G. Set field-adjustable circuit-breaker trip ranges to values indicated on the Drawings.

3.3 IDENTIFICATION

A. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that each fuse has adequate mechanical support and contact integrity.
f. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.

C. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
e. Determine the following by primary current injection:

1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

SECTION 28 4621.11

ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Existing fire-alarm system to be modified.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Duct smoke detectors.
5. Carbon monoxide detectors.
6. Fire-alarm notification appliances.
7. Fire-alarm addressable interface devices.

B. Related Requirements:
1. Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables" for cables and conductors for fire-alarm systems.

1.2 DEFINITIONS

A. FACU: Fire-alarm control unit.

B. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.
2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

1.3 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. When new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from building.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:

    a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
    b. Provide "Fire-Alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72.
    c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.
    d. Riser diagram.
    e. Device addresses.
    f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
    g. Record copy of site-specific software.
    h. Provide "Inspection and Testing Form" in accordance with "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

        1) Equipment tested.
        2) Frequency of testing of installed components.
        3) Frequency of inspection of installed components.
        4) Requirements and recommendations related to results of maintenance.
        5) Manufacturer's user training manuals.

    i. Manufacturer's required maintenance related to system warranty requirements.
    j. Abbreviated operating instructions for mounting at FACU and each annunciator unit.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
2. Installation must be by personnel certified by NICET as fire-alarm Level II technician.
3. Obtain certification by NRTL in accordance with NFPA 72.
4. Licensed or certified by authorities having jurisdiction.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail because of defects in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXISTING FIRE-ALARM SYSTEM TO BE MODIFIED

A. Basis for Pricing: Simplex; brand of Johnson Controls International plc, Building Solutions North America.

B. Source Limitations for Fire-Alarm System and Components: Components must be compatible with, and operate as extension of, existing system. Provide system manufacturer's certification that components provided have been tested as, and will operate as, a system.

2.2 SYSTEM SMOKE DETECTORS

A. Photoelectric Smoke Detectors:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Simplex; brand of Johnson Controls International plc, Building Solutions North America.

2. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 268.

b. General Characteristics:

1) Detectors must be two-wire type.
2) Base Mounting: Detector and associated electronic components must be mounted in twist-lock module that connects to fixed base. Provide terminals in fixed base for connection to building wiring.
3) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
4) Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
5) Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
6) Operator at FACU, having designated access level, must be able to manually access the following for each detector:

a) Primary status.

b) Device type.
c) Present average value.
d) Present sensitivity selected.
e) Sensor range (normal, dirty, etc.).

7) Detector must have functional humidity range within 10 to 90 percent relative humidity.
8) Color: White.

2.3 DUCT SMOKE DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Simplex; brand of Johnson Controls International plc, Building Solutions North America.

B. Description: Photoelectric-type, duct-mounted smoke detector.

C. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Detectors must be two-wire type.
b. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
c. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
d. Integral Visual-Indicating Light: LED type, indicating detector has operated.
e. Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
f. Operator at FACU, having designated access level, must be able to manually access the following for each detector:

1) Primary status.
2) Device type.
3) Present average value.
4) Present sensitivity selected.
5) Sensor range (normal, dirty, etc.).

g. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with supplied detector for smoke detection in HVAC system ducts.
h. Each sensor must have multiple levels of detection sensitivity.
i. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
j. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.4 CARBON MONOXIDE DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Simplex; brand of Johnson Controls International plc, Building Solutions North AmericaDescription: Carbon monoxide detector listed for connection to fire-alarm system.

C. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72
b. NFPA 720.
c. UL 2075.

2. General Characteristics:

a. Mounting: Adapter plate for outlet box mounting.
b. Testable by introducing test carbon monoxide into sensing cell.
c. Detector must provide alarm contacts and trouble contacts.
d. Detector must send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
e. Locate, mount, and wire in accordance with manufacturer's written instructions.
f. Provide means for addressable connection to fire-alarm system.
g. Test button simulates alarm condition.

2.5 FIRE-ALARM NOTIFICATION APPLIANCES

A. Fire-Alarm Audible Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Simplex; brand of Johnson Controls International plc, Building Solutions North America.

2. Description: Horns, bells, or other notification devices that cannot output voice messages.
3. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.

b. General Characteristics:

1) Individually addressed, connected to signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.
2) Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
3) Sounders, High Volume 24 V(dc): Less than 6 mA of alarm current.
4) Sounders, Low Volume 24 V(dc): Less than 4 mA of alarm current.
5) Audible notification appliances must have functional humidity range of 10 to 95percent relative humidity.

6) ISO Temporal 3 Evacuation Tone: 90 plus or minus 4 dB(A-weighted) at 24 V.
7) ISO Temporal 3 Alert Tone: 95 plus or minus 5 dB(A-weighted) at 24 V.
8) AS2220 Evacuation Tone: 93 plus or minus 4 dB(A-weighted) at 24 V.
9) AS2220 Alert Tone: 93 plus or minus 5 dB(A-weighted) at 24 V.
10) Horns: Electric-vibrating-polarized type, 24 V(dc); with provision for housing operating mechanism behind grille. Comply with UL 464. Horns must produce sound-pressure level of 90 dB(A-weighted), measured 10 ft. from horn, using coded signal prescribed in UL 464 test protocol.
11) Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Fire-Alarm Voice/Tone Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Simplex; brand of Johnson Controls International plc, Building Solutions North America.

2. Description: Notification appliances capable of outputting voice evacuation messages.
3. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 1480.

b. General Characteristics:

1) Speakers for Voice Notification: Locate speakers for voice notification to provide intelligibility requirements of "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
2) High-Range Units: Rated 2 to 15 W.
3) Low-Range Units: Rated 1 to 2 W.
4) Mounting: Flush.
5) Matching Transformers: Tap range matched to acoustical environment of speaker location.
6) Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

C. Fire-Alarm Visible Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Simplex; brand of Johnson Controls International plc, Building Solutions North America.

2. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 1971.

b. General Characteristics:

1) Rated Light Output:

a) 15/30/75/110 cd, selectable in field.

2) Clear or nominal white polycarbonate lens mounted on aluminum faceplate.
3) Mounting: Wall mounted unless otherwise indicated.
4) For units with guards to prevent physical damage, light output ratings must be determined with guards in place.
5) Flashing must be in temporal pattern, synchronized with other units.
6) Strobe Leads: Factory connected to screw terminals.

2.6 FIRE-ALARM ADDRESSABLE INTERFACE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Simplex; brand of Johnson Controls International plc, Building Solutions North America.

B. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Include address-setting means on module.
b. Store internal identifying code for control panel use to identify module type.
c. Listed for controlling HVAC fan motor controllers.
d. Monitor Module: Microelectronic module providing system address for alarm-initiating devices for wired applications with normally open contacts.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Preinstallation Testing: Perform verification of functionality of installed components of existing system prior to starting work. Document equipment or components not functioning as designed.

B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service in accordance with requirements indicated:

1. Notify Architect no fewer than seven days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Architect's written permission.

C. Protection of In-Place Conditions: Protect devices during construction unless devices are placed in service to protect facility during construction.

3.3 INSTALLATION OF EQUIPMENT

A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before other trades have completed cleanup must be replaced.
2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.

1. Connect new equipment to existing control panel in existing part of building.
2. Connect new equipment to existing monitoring equipment at supervising station.
3. Expand, modify, and supplement existing control equipment as necessary to extend existing control functions to new points. New components must be capable of merging with existing configuration without degrading performance of either system.

C. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in normal path of egress within 60 inch of exit doorway.
2. Mount manual fire-alarm box on background of contrasting color.
3. Operable part of manual fire-alarm box must be between 42 and 48 inch above floor level. Devices must be mounted at same height unless otherwise indicated.

D. Smoke-Detector Spacing:

1. Comply with "Smoke-Sensing Fire Detectors" section in "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. HVAC: Locate detectors not closer than 36 inch from air-supply diffuser or return-air opening.
3. Lighting Fixtures: Locate detectors not closer than 12 inch from lighting fixture and not directly above pendant mounted or indirect lighting.

E. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend full width of duct. Tubes more than 36 inch long must be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

G. Remote Status and Alarm Indicators: Install in visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

H. Audible Alarm-Indicating Devices: Install not less than 6 inch below ceiling. Install bells and horns on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inch below ceiling. Install devices at same height unless otherwise indicated.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 26 0526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate must be laminated acrylic or melamine plastic signs, as specified in Section 26 0553 "Identification for Electrical Systems."

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

3.6 PATHWAYS

A. Pathways above recessed ceilings and in inaccessible locations may be routed exposed.

1. Exposed pathways must be installed in EMT.

B. Exposed EMT must be painted red enamel.

3.7 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 08 7100 "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with supervised interface device to the following devices and systems. Install interface device less than 36 inch from device controlled. Make addressable confirmation connection when such feedback is available at device or system being controlled.
1. Smoke dampers in air ducts of designated HVAC duct systems.

3.8 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 27 0553 "Identification for Communications Systems."

3.9 GROUNDING

A. Ground shielded cables at control panel location only. Insulate shield at device location.

3.10 FIELD QUALITY CONTROL

A. Field tests must be witnessed by authorities having jurisdiction.

B. Administrant for Tests and Inspections:
1. Administer and perform tests and inspections.

C. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.

2. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Factory-authorized service representative must prepare "Fire Alarm System Record of Completion" in "Documentation" section of "Fundamentals" chapter in NFPA 72 and "Inspection and Testing Form" in "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Excavating, trenching, and backfilling for footings, foundations, utilities within the building, slabs-on-grade, concrete sidewalks, ramps, and stairs.

B. Dewatering.

C. Temporary excavation support and protection systems.

D. Excavating and backfilling trenches required in conjunction with underground mechanical and electrical utilities and buried mechanical and electrical appurtenances where indicated to be provided under this contract.

1. Refer to plumbing, mechanical and electrical sections for excavation and backfill required in conjunction with underground plumbing, mechanical and electrical utilities and buried mechanical and electrical appurtenances.

E. Preparing subgrades for all excavate areas.

F. Drainage course for slabs on grade, footings, trenches, retaining walls, sidewalks, stairs, and ramps

G. Select fill.

H. Subsurface drainage and backfill for walls, trenches, and under slab

I. Final grading

1.3 RELATED REQUIREMENTS

A. Section 01 4533 - Code-Required Special Inspections and Procedures.

B. Section 01 5713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

C. Section 01 7000 - Execution: Project conditions; protection of bench marks, scoping, survey control points, temporary bracing and shoring, dewatering, and water control

D. Section 03 3000 - Cast-in-Place Concrete.

E. Section 32 9220 - Restoration of Turf Areas.

1.4 REFERENCE STANDARDS

A. All references apply to the latest revisions of the publications.

B. ASTM D422: Particle Size Analysis of Soils

C. ASTM D1556: Density and Unit Weight of Soil in Place by the Sand-Cone Method

D. ASTM D1557: Laboratory Compaction Characteristics of Soil Using Modified Effort

E. ASTM D2922: Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

F. ASTM D2974: Moisture, Ash and Organic Matter of Peat and other Organic Soils

G. ASTM D3017: Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

H. ASTM D4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soils (Atterberg Limits)

I. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Record drawings at project closeout according to Section 01 7800 - Closeout Submittals. Show locations of installed support materials left in place, including referenced locations and depths, on drawings.

C. Shoring Installer's Qualification Statement.

D. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

E. Product Data: For the following:
   1. Sieve Analysis, Proctor Compaction Test and Certification of Specification Compliance for each fill materials and mix design proposed for flowable fill at least 15 days before start of backfilling. Flowable fill submittal shall include ASTM C 1260 test results.
   2. Each type of plastic warning tape.
   3. Geotextile.
   4. Controlled low-strength material, including design mixture.
   5. Geofoam.
   6. Contractor shall submit copies of proposed materials with locations, methods and operations of backfilling and compaction.

F. Samples: For the following:
   1. 12-by-12-inch Sample of subdrainage geotextile.
   2. A 25-pound sample of each type of off-site fill material that is to be used at the site in an air-tight container for the testing laboratory, a minimum of one week prior to delivery to the site. Submit samples to the Geotech Engineer. Use of these proposed materials by the Contractor prior to testing and approval or rejection shall be at the Contractor’s own risk.

G. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curves according to ASTM D 2487 for each on-site or borrow soil material proposed for fill and backfill.
   3. Optimum moisture-maximum density curve for each soil material.
   4. Environmental testing results according to NYSDEC Part 375-6 and NYSDEC Policy Document CP-51 for all off-site imported fill/topsoil material proposed for fill or backfill. Provide results to be reviewed and approved by Owner's Representative for all analyses corresponding to the full list of Volatiles, Semi-volatiles, TAL metals, Pesticides/Herbicides, and PCB’s. Results will be compared to Part 375-6.8 Unrestricted Use Soil Cleanup Objectives (SCO’s). One composite sample analysis required per 1,000 cubic yards of imported fill.
   5. Submit the name of each supplier and specific type and source of each material. Any change in source throughout the job requires approval of the Owner's Representative.
   6. Submit soil test reports for organic content of loam from off-site sources. Loam shall closely match the approved samples and not be delivered to the site prior to receiving approval of the soil test report.

H. Pre excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.6 QUALITY ASSURANCE

A. Comply with: New York State Department of Transportation (NYSDOT) “Standard Specifications for Construction and Materials”. Notify Owner's Representative of conflicts with these specifications.

B. Routine testing of existing soils and compacted material for compliance with these specifications will be performed as part of Contractor's responsibility.
   1. Compacted material not meeting density requirements shall be removed or re compacted and retested at Contractor’s expense.

2. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
    a. Pre installation Conference: Conduct conference at Project site to comply with requirements of Division 1
3. Section 01 3000 - Administrative Requirements for Project Meetings.
    a. Before commencing earthwork, meet with Owner's Representative and Testing Agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.
4. Codes and Standards: Perform earthwork complying with requirements of State NY Uniform Fire and Building Code.
5. Testing and Inspection Service: Each Contractor will employ and pay for a qualified independent geotechnical testing and inspection laboratory to perform soil testing and inspection service during earthwork operations to include but not be limited to the following:
    a. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
        a) Field reports; in-place soil density tests.
        b) One optimum moisture-maximum density curve for each type of soil encountered.
        c) Inspections and certifications shall be performed by a licensed engineer registered in the State of NY.

C. Temporary Support and Excavation Protection Plan:
1. Indicate sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property.
2. Include drawings and calculations for bracing and shoring.
3. Bracing and shoring design to meet requirements of OSHA’s Excavation Standard, 29 CFR 1926, Subpart P.

1.7 DEFINITIONS

A. Excavation shall mean the excavation, removal, stockpiling, and/or satisfactory disposal of all materials encountered within the limits indicated or specified other than rock or ledge. Excavated materials shall include, but not be limited to removal of material encountered above subgrade elevations indicated, earth materials such as peat, organic or inorganic silts, clay, sand, gravel, pavements, cobble and boulders less than 1.0 cubic yard in volume, soft or disintegrated rock which, in the opinion of the Owner's Representative and Engineer, can be removed without blasting or drilling; pavement, brick and concrete masonry, and all obstructions not specifically included in another Section.

B. Excavation: and subsequent disposal of materials removed.

C. Unauthorized Excavation: Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner's Representative and Engineer. Unauthorized excavation and remedial work directed by Owner's Representative and Engineer shall be at Contractor's expense.

D. Authorized Additional Excavation: If the Owner's Representative determines bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered. Replace excavated material as directed by Owner's Representative and Engineer.
1. Removal of unsuitable material and replacement as directed will be paid on basis of conditions of contract relative to Allowances listed in changes in the work.

E. Excavation classified as "unclassified" and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered, pavements and other obstructions visible on ground surface, underground structures, utilities and other items indicated to be demolished and removed, together with earth and other materials, including rock.

F. Excavation classified as "earth excavation" and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered, pavements and other obstructions visible on ground surface, underground structures, utilities and other items indicated to be demolished and removed, together with earth and other materials, including rock.

G. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

H. Drainage Fill: Layer supporting slab-on-grade, concrete pavement, stairs, ramps, and footingsused to minimize capillary flow of pore water.

I. Select Fill: Soil material to raise existing grades supporting slab-on-grade, concrete pavement, stairs, ramps, and footings.

J. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

K. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

L. Structures: footings, retaining walls, slabs, or curbs, or other man-made stationary features constructed above or below the ground surface.

M. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

N. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below select fill, drainage fill, and topsoil materials.

O. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.8 PROJECT CONDITIONS

A. Verify existing grades and notify Architect of differing conditions.

B. Verify that survey bench mark and intended elevations for the Work are as indicated.

C. Project Site Information: A geotechnical report has not been prepared for this Project.

D. Existing Utilities: Locate existing underground utilities in work area before starting earthwork operations.
   1. **Refer to Section 01 7000 - Execution for scoping requirements.**
   2. Where utilities are to remain in place, provide adequate means of protection during earthwork operations.
   3. If uncharted or incorrectly charted piping or other utilities are encountered during excavation, consult with Owner's Representative immediately for directions. Cooperate with Owner's Representative and public and private utility companies to keep services and facilities in operation. Repair damaged utilities as required by utility owner.
      a. Do not interrupt existing utilities serving facilities occupied by Owner and Owner's Representative or others during occupied hours except when permitted in writing by Owner's Representative and then only after acceptable temporary utility services have been provided.
         a) Provide minimum two (2) or five (5) days notice to Owner's Representative and receive written notice to proceed before interrupting utilities.

E. Demolish and remove from site existing underground utilities indicated to be removed. Coordinate with utility companies and MEP prime contractors for shutoff of services if lines are active.

1.9 CONTRACTOR'S REPSPONSIBILITY

A. The Contractor shall provide adequate personnel and equipment to complete the Work as specified herein and within the agreed upon Project Construction Schedule. The Contractor shall employ qualified English-speaking supervisor who shall provide adequate and efficient coordination of the Work. The

supervisor shall be present on the site on a continuous full-time basis and shall have the authority to act on behalf of the Contractor.

B. Prior to the beginning of any site grading, the Contractor shall make sufficient checks on the topographic conditions to satisfy him/herself that the existing elevations are as shown by the topographic survey and on the Contract Drawings. Should any discrepancies be found they shall be reported to the Owner's Representative in writing prior to commencement of any work.

C. Each Contractor shall review all Drawings, Specifications and all other information included in Contract Documents and shall determine the quantities of the work to be completed and be responsible for the assumptions made in determining the cost of the Work.

D. Each Contractor shall coordinate and complete his work in such a manner as to interfere as little as possible with all other contractors and/or subcontractors working on the site.

1.10 PROTECTION

A. Trees and Shrubbery:
1. Existing trees and shrubbery to remain shall be protected from injury during construction.
2. Except as otherwise directed, cutting and trimming of existing trees will not be permitted.
3. All existing trees to remain and which may be damaged by construction operations shall be boxed and placed and protected and all such protection shall be maintained until completion of the work.

B. Existing Utilities:
1. Excavation and backfill operations shall be done in such a manner as to prevent cave-ins of excavations or the undermining, damage, or disturbing of existing utilities and structures or of new work.
2. Backfill shall be placed and compacted so as to prevent future settlement or damage to existing utilities, structures, new work, and in accordance with the requirements of the particular utility company.
3. Any excavation improperly backfilled or where settlement occurs shall be reopened to the depth required, then refilled with new materials and compacted, and the surface restored to the required grade and condition, at no additional cost to the Owner.

C. Paved surfaces:
1. Do not operate equipment that will cause damage on paved surfaces that are to remain. Any damage to existing roads or other paved surfaces caused by construction equipment shall be repaired at no additional cost to Owner.

D. Property:
1. Any damage due to excavation, backfilling or settlement of the backfill or injury to persons or damage to property occurring as a result of such damage, shall be the responsibility of each Contractor. All costs to repair such damage, in a manner satisfactory to the Owner, shall be borne by each Contractor, at no additional cost to the Owner.

1.11 PRODUCT HANDLING

A. Store materials to preserve their quality and fitness for work.

1.12 WORKMANSHIP

Contractor shall be responsible for correction of work not conforming to specified requirements. Correct deficient work as directed by Owner's Representative.

A. Remove work found to be defective. Replace with new acceptable work.

PART 2 PRODUCTS -

2.1 CLASSIFIED EXCAVATION

A. Excavation for this project shall be "unclassified".
1. Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.

No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

B. Pipes and conduits shall be provided with 6 inches of Pipe Zone Bedding material to eliminate differential settlement.

2.2 SOIL MATERIALS

A. Excavations General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, and PT or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
2. Materials containing excessive amounts of water, plastic clay, vegetation, organic matter, debris, pavement, stones or boulders over 3 inches in greatest dimension, frozen material, and material which, in the opinion of the Owner's Representative and consultants will not provide a suitable foundation or subgrade.

D. General Fill Material: Soil materials free of clay, rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. **Not to be used against basement or retaining wall**.

E. Select Fill: Sound and durable, well-graded sand and gravel, free of deleterious materials such as pyritic shale, organics, or contaminants of a chemical, mineral, or biological nature and conforming to New York State Department of Transportation, paragraph 304-2.02, Type 2 and the following limits of gradation:

100%	passing a 2" sieve.
30-90%	passing a #10 sieve.
10-70%	passing a #40 sieve.
0-5%	passing a #200 sieve

1. Location: Use for sub-base fill under slabs, pavements, over undistrube soil, and unsutiable soil material.

F. Drainage Fill: ASTM C-33 Blend 57, a blend of NYSDOT No. 1 and No. 2 crushed stone that complies with material specification requirements of Article 703-02 for crushed stone and the following limits of gradation:

% Passing By Weight	Sieve Size
100%	1" sieve.
40-50%	3/4"
25-60%	passing a 1/2" sieve.
10-30%	passing a 3/8" sieve
0-10%	passing a # 4 sieve.
0-5%	passing a # 8 sieve

1. Location: Under slabs on grade, sidewalks, ramps, concrete stairs, and footings.

G. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

1. Location: Under water, sanitary, and conduit.

H. Topsoil : Friable loam; local borrow.

1. Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0.
2. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.

I. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a very stiff state.

J. Recycled material shall not be permitted.

K. Slag of any kind shall not be permitted.

2.3 ACCESSORIES

A. Bedding and Fill to Correct Over-Excavation:
   1. Select Fill.

B. Underground Warning Tapes:
   1. Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
      a. Red: Electric.
      b. Yellow: Gas, oil, steam, and dangerous materials.
      c. Orange: Telephone and other communications.
      d. Blue: Water systems.
      e. Green: Sewer systems.

2.4 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material as follows:
   1. Portland Cement: ASTM C 150, Type I , II , or III.
   2. Fly Ash: ASTM C 618, Class C or F.
   3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch nominal maximum aggregate size.
   4. Foaming Agent: ASTM C 869.
   5. Water: ASTM C 94/C 94M.
   6. Air-Entraining Admixture: ASTM C 260.
   7. Produce low-density, controlled low-strength material with the following physical properties:
      a. As-Cast Unit Weight: 36 to 42 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
      b. Compressive Strength: 80 psi , when tested according to ASTM C 495.
      c. Location: Over all utilities passing under vehcular traffic

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

B. Survey existing adjacent structures and improvements and establish exact elevations at fixed points to act as benchmarks.

C. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends **less than** 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by Owner's Representative. If the proposed excavation extends **more than** 1 foot into the prevailing groundwater, control groundwater intrusion with a comprehensive dewatering procedures, as directed by Owner's Representative.

3.2 PREPARATION

A. See Section 31 1000 for clearing, grubbing, and removal of existing debris.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Protect existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations..

D. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Owner's Representative

E. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

F. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

G. Protect and maintain erosion and sedimentation controls, which are specified in Section Site Clearing" during earthwork operations.

3.3 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.

1. Excavations in stable rock or in less than 5 feet in depth in ground judged as having no cave-in potential do not require excavation support and protection systems.

3.4 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrade, and from flooding Project site, and surrounding area.

B. Each Contractor shall provide, maintain and operate pumps of adequate capacity required to maintain excavations, pits, trenches and depressions within the Contract Limit Lines as well as the Buildings free of water accumulated at any time and as necessary to permit the proper installation of the work required under all contracts. Disposal of pumped water shall be done with due respect to the rights of adjoining buildings. All costs in connection with the removal of water as above provided for shall be borne by each Contractor.

3.5 EXPLOSIVES

A. Explosives: Do not use explosives.

3.6 EXCAVATING GENERAL

A. Underpin adjacent structures that could be damaged by excavating work.

B. Excavate to accommodate construction operations.

1. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
2. Cut utility trenches wide enough to allow inspection of installed utilities.
3. Hand trim excavations. Remove loose matter.
4. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

C. Notify Owner's Representative of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Provide temporary means and methods, as required, to remove all water from excavations until directed by Owner's Representative. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.7 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. Install underground warning tape at buried utilities .

3.8 REPAIR

A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

3.9 STABILITY OF EXCAVATIONS

A. Comply with Section

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace, where sloping is not possible because of space restrictions or stability of material excavated, to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.10 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. When rock is encountered, remove additional 12” of material and provide compacted drainage fill to eliminate differential settlement.
3. Footing adjacent to existing building shall bear at same elevation or deeper.
4. Excavation for Basins Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch .

3.11 EXCAVATION FOR WALKS AND PAVEMENTS

A. See Section 32 1313 - Concrete Paving for excavation and backfilling requirements. Construct to indicated cross sections, elevations, and grades.

B. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades

3.12 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inches on each side of pipe or conduit.
2. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
3. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
    a. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
    b. Bed pipe in bedding and backfill material as described in Part 2, including 6 inches below pipe to 12 inches above pipe. Material shall be thoroughly compacted.
    c. The balance of the trench shall be filled with drainage fill, bedding or backfill material placed in 12 inch maximum lifts thoroughly compacted to subgrade for crushed stone drainage layer or to subgrade for pavement stone base as applicable.

3.13 SUBGRADE INSPECTION

A. Notify Owner's Representative when excavations have reached required subgrade.

B. If Testing Laboratory determines that unsatisfactory soil is present, notify the Owner's Representative prior to proceeding. At the direction of the Owner's Representative, continue excavation and replace with compacted backfill or select fill material as directed.

1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction[, repeating proof-rolling in direction perpendicular to first direction]. Limit vehicle speed to 3 mph .
   2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner's Representative, and replace with compacted backfill or select fill as directed.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.14 UNAUTHORIZED EXCAVATION

A. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's Representative, without additional compensation.

3.15 STORAGE OF SOIL MATERIALS

A. Stockpile borrows material and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
   2. Provide tarp or erosion control fabric on stockpile material and a silt fence around stockpiled material.
   3. Material stockpiled outside the contract area shall be in locations approved by the Owner. If areas are not available store material off site at contractor's expense.

3.16 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Surveying locations of underground utilities for record documents.
   2. Inspecting and testing underground utilities.
   3. Removing concrete formwork.
   4. Removing trash and debris.
   5. Removing temporary shoring, bracing, and sheeting.
   6. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.17 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section Cast-in-Place Concrete

D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch , to a height of 12 inches over the utility pipe or conduit.

E. Coordinate backfilling with utilities testing.

F. Backfill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

G. Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.18 FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material and drainage fill.
   3. Under steps and ramps, use select fill and drainage fill.
   4. Under building footings, foundations and slabs on grade, use select fill and drainage fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.19 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.20 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557.

3.21 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.
   3. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
   4. Where topsoil is to be placed, scarify surface to depth of 3 inches.
   5. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

3.22 DRAINAGE FILL

A. Under slabs-on-grade, pavements, walks, ramps, and stairs place drainage course on prepared subgrade and as follows:
   1. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.
   2. When compacted thickness of drainage course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches thick when compacted.
   3. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.23 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces by Fuller and D'Angelo, P.C. before placement of foundations.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect
2. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.24 CLEANING

A. Remove excavated material that is unsuitable for re-use from site.

B. Remove excess excavated material from site.

3.25 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

F. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

G. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.26 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove all surplus soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 32 1313
CONCRETE PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Concrete sidewalks and stair steps and foundations.

B. Abrasive metal nosing for concrete stairs.

C. Concrete Admixtures.

D. Miscellaneous site concrete.

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 05520 - Handrails and Railings

C. Section 07 9200 - Joint Sealants: Sealing joints.

D. Section 31 2316 - Excavation: Preparation of site for base and preparation of subsoil.

1.4 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.

B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

C. ACI 305R - Guide to Hot Weather Concreting; 2010.

D. ACI 306R - Guide to Cold Weather Concreting; 2016.

E. ACI 308 - Standard Specification for Curing Concrete

F. ACI 309R - Guide for Consolidation of Concrete

G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary

H. ACI 357 - Guide for the Design and Construction of Fixed Offshore Concrete Structures

I. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision (2018).

K. ASTM A 706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

L. ASTM A 820 / A 820M - Standard Specification for Steel Fibers for Fiber-Reinforced Concrete

M. ASTM A 996 - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

N. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

O. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.

P. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.

Q. ASTM C 138 / C 138 M - Standard Test for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

R. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

S. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

T. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

U. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

V. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

W. ASTM C 989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on joint filler, admixtures, and curing compound.

C. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials and aggregates.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures
4. Curing compounds.
5. Applied finish materials.
6. Bonding agent or adhesive.
7. Joint fillers.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

B. Installer Qualifications: An experienced installer, with a minimum of 5 years experience, who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Hydrophobic Concrete Admixture Manufacturer Qualifications: Hydrophobic Concrete Admixture Manufacturer will have a minimum of 5 years of documented experience on projects of similar scope.

D. Ready-Mixed Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.
2. Verification of Performance: Provide ready-mixed concrete from a concrete supplier approved by the Hydrophobic Concrete Admixture Manufacturer and authorized to dispense the Hydrophobic Concrete Admixture Manufacturer’s waterproofing materials.

E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1.7 PRE-INSTALLATION CONFERENCE

A. Attendance: Contractor, installer, owner, and architect and those requested to attend.

B. Meeting Time: Minimum of 3 weeks prior to the beginning of the work of this Section and work of related Sections affecting the work of this Section.

C. Location: Project site.

D. Review procedures for conducting work of this Section, including:
   1. Review of mix design and mix test results.
   2. Mixing procedure.
   3. Conditions for acceptance of concrete at project site.
   4. Placement procedures.
   5. Finishing options and procedures.
   6. Curing and crack control procedures.
   7. Testing for acceptable moisture emissions, alkalinity pH levels, and relative humidity of concrete slab prior to installation of finish flooring.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Conform to provisions of the Section 01 6000 - Product Requirements and the Hydrophobic Concrete Admixture Manufacturer instructions.

B. Mixing and Delivery: Conform to ASTM C94.

C. Sampling at Delivery: Conform to ASTM C172. Cure 4-inch by 8-inch cylinders to provisions of ASTM C31 and compression test compressive strength of cylinders to ASTM C39.

D. Batch Tickets: Conform to ASTM C94 Option A or C. Accompany each load, fully executed, and signed. Log in with inspector at time of entry. Conform to Source Quality Control requirements specified by this Section.
   1. Include water content and water withheld at batch plant.
   2. Indicate time to nearest minute that batch was dispatched from plant, when it arrived at site, and when unloading began and was finished.
   3. Indicate ambient air temperature and concrete internal temperature at time of arrival.
   4. Make written record of water and other additives added to design mix, and the amount of concrete in the truck at the time of addition, after the mix truck left the batch plant.

E. Reject concrete that has reached internal temperature of 89 degrees Fahrenheit or above and when temperature has risen 5 degrees in 10 minutes, indicating concrete is setting up prior to discharge.

F. Store products in accordance with ACI 301. Do not use admixtures that have been in storage at project site for more than 12 months or which have been subjected to freezing, except as accepted by the Hydrophobic Concrete Admixture Manufacturer and by the structural engineer based on test results

1.9 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities

PART 2 PRODUCTS

2.1 PAVING ASSEMBLIES

A. Concrete: 4,000 psi 28 day concrete, thickness as shown on drawings, buff color Portland cement exposed aggregate finish.

2.2 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 80 (80,000 psi) yield strength; deformed billet steel bars; epoxy coated.

B. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; epoxy coated.

C. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi yield strength; deformed billet steel bars; epoxy coated finish.

D. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Normal - Type I Portland cement, buff color.

B. Fine and Coarse Mix Aggregates: ASTM C33/C33M.

C. Water: Clean, and not detrimental to concrete.

D. Air-Entraining Admixtures: ASTM C260/C260M.

2.4 ACCESSORIES

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

C. Curing compound: Per NYS00T Standard Speciifcations Section 701.

D. Joint Sealers: Refer to Section 07 9200 - Joint Sealants .

E. Expansion Joint Cap Strip: Extruded, plastic, removable strip made specifically for forming recessed joint. Vinylex, Knoxville, TN 37921 (615) 690-2211

2.5 CONCRETE MIX DESIGN

A. Concrete Properties:
   1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4,000 psi.
   2. Air Content: 6.0 percent for 3/4-inch (19-mm) maximum aggregate.
      a. Exposed concrete shall be provided with air entraining of mixture.
   3. Maximum Slump: 4 inches.
   4. Maximum Aggregate Size: 3/4 inch.
   5. Maximum water - cement ratio 0.44.

2.6 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

B. The concrete ready mix supplier must contact the Waterproof Concrete Admixture Manufacturer before designing and testing any new mix designs, to receive guidance on achieving proper water absorption characteristics. The concrete ready mix supplier must also report the test results to the Waterproof Concrete Admixture Manufacturer. All values must be within the manufacturer's specification limits.
   1. Test result requirements for Hydrophobic Concrete in addition to engineer’s performance requirements: Corrected 30 minute water absorption, age at test 7 days (BS 1881-122): Not greater than 1.0%
   2. All concrete materials used for testing must be same as concrete materials used for construction.

C. All concrete for exterior exposed concrete including sidewalks, ramps, steps will be waterproofed by the addition of Waterproof Concrete Admixture and additional ingredients including:
   1. Waterproof Concrete Admixture at the rate of one U.S. gallon per cubic yard of concrete
   2. Superplasticizer at the manufacturer’s recommended rate and appropriate for the placement requirements of the project.
   3. Water-Cement Ratio: 0.42 maximum. Water content of Hydrophobic Concrete Admixture and other admixtures to be included in the water-to-cementitious ratio.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Site verification of conditions:
   1. Verify that site conditions are acceptable for placement of waterproofed concrete.
   2. Do not proceed with concrete placement until conditions unacceptable to the Hydrophobic Concrete Admixture Manufacturer are corrected.

D. Suitable Condition of Reinforcing Steel:
   1. At the time concrete is placed, reinforcement shall be free from mud, oil, or other nonmetallic coatings that decrease bond. Epoxy-coating of steel reinforcement in accordance with standards shall be permitted.
   2. Except for prestressing steel, steel reinforcement with rust, mill scale, or a combination of both shall be considered satisfactory, provided the minimum dimensions (including height of deformations) and weight of a hand-wire-brushed test specimen comply with ASTM A 615, ASTM A 706, ASTM A 996.

3.2 SUBBASE

A. See Section 31 2316 - Excavation for construction of base course for work of this Section.

3.3 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

3.4 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

D. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement. Provide edge forms for all area where brick pavers or installed in concrete pavements.

E. Forms for concrete curbs shall be steel or wood, straight or curved sections, free from warp, and of such construction that there will be no interference to inspection for grade or alignment. All forms shall extend for the full curb depth and shall be braced and secured adequately so that no displacement from alignment will occur during placing of concrete

3.5 REINFORCEMENT

A. Place reinforcement at midheight of slabs-on-grade.

B. Interrupt reinforcement at contraction joints.

C. Place dowels to achieve pavement and curb alignment as detailed.

3.6 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

D. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

E. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only

square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

2. Pour all curbs integral with walkways.

3.7 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.

1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
2. Secure to resist movement by wet concrete.

C. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

D. Provide scored joints.

1. At 3 feet intervals.

3.8 FINISHING

A. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

B. Median Barrier: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.9 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

3.10 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

1. Provide free access to concrete operations at project site and cooperate with appointed firm.
2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.

1. Perform one slump test for each set of test cylinders taken.

C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.11 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Protect installed work from damage due to subsequent construction activity on the site.

C. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 32 9220
RESTORATION OF TURF AREAS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The contractor shall supply all materials, equipment, labor, incidentals and maintenance required in order to provide an acceptable stand of turf by topsoiling and seeding of all disturbed areas including stripping topsoil, grading, placing topsoil, fertilizing and seeding, in accordance with the drawings and as specified.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: From site stockpiles or friable loam, typical of cultivated topsoils available locally, containing at least 3 percent of decayed organic matter (humus), taken from a well-drained, arable site. Topsoil shall be reasonably free of subsoil, stones, earth, clods, sticks, roots, or other objectionable extraneous matter or debris. It shall contain no toxic materials. Only the finest, most organic topsoil shall be used. No topsoil shall be spread or delivered in a frozen or muddy condition

B. Fertilizer: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.
   1. Manufacturers:
      a. Profile Products; BioPrime: www.profileevs.com/#sle.
      b. Jonathan Green “New Seeding Lawn Fertilizer.

C. The seed used shall be fresh, re-cleaned seed of the latest crop containing a blend of those listed below and shall be harvested from one field to ensure a uniform color and texture. Percentages of each grass type are to be within the given range for that type:
   1. Devine Perennial Ryegrass
   2. America Kentucky Bluegrass
   3. Apollo Kentucky Bluegrass
   4. Limousine Kentucky Bluegrass
   5. Midnight Kentucky Bluegrass
   6. Manufacturer:
      a. Chas. C. Hart Seed Company, Wethersfield, Ct. 1-800-326-HART

D. Mulch: Mulch shall be approved salt hay or weed free straw and stabilized with a binder.

PART 3 - CONSTRUCTION

3.1 SEEDBED PREPARATION

A. Seasonal and weather limitations - All operations including seedbed preparation shall be performed only when the soil is in proper condition to permit satisfactory work. Continuation of work at other than specified times or conditions shall proceed only with consent of the Architect.

B. Leveling - Any undulations or irregularities in the surface resulting from fertilization, tillage or any other causes shall be leveled prior to seeding. Flooded, washed out, or otherwise damaged areas shall be reconstructed and all grades reestablished in conformance with the drawings and specifications.

C. Cleanup - Prior to seeding, the surface shall be cleared of all trash, debris and stone larger than 1-1/2 diameter and of all roots, brush, wire, grade stakes and other objects that could be a hindrance to maintenance operations and use.

D. Fertilizing - After final seedbed preparation, apply fertilizer at the manufacturer's recommended rate indicated on the bag. Fertilizer shall be distributed evenly over all areas to be seeded by machine, or as

otherwise approved by the Architect, and shall be worked lightly into the top 1 inch of the rootzone mixture.

3.2 SEEDING

A. The contractor shall furnish and place all materials required for seeding in all top soiled areas.

B. All areas to be seeded shall be thoroughly disked or otherwise loosened to a depth of 4 inches and shall be raked to true lines free from all unsightly variations, bumps, ridges, or depressions. All sticks, stones, roots or other objectionable material which might interfere with the formation of a finely pulverized seed bed shall be removed from the soil. Ground limestone and commercial fertilizer shall be applied as specified above.

C. The soil shall then be raked to a smooth, even draining surface and compacted with an approved roller as directed by the Architect. Any depressions which occur shall be regraded and rerolled until a satisfactory grade is obtained.

D. The rate of seeding shall be 10 lbs. per 1000 sq. ft. of area. Grass seed shall be sown by approved machine in such manner that a uniform stand will result and as indicated on the drawings for the upper field.

E. Grass seed shall be sown preferably in the fall between August 25 and October 1, in the spring between March 15 and May 1, or at such other times as are approved by the Architect. All seeding is to be done in dry or moderately dry soil and at times when the wind does not exceed a velocity of 5 miles per hour.

3.3 MULCHING

A. All seeded areas shall be mulched not later than three (3) days following seeding. Ground surfaces shall be completely covered at a rate of at least two (2) tons per acre.

B. Mulch shall be anchored using jute or other approved netting properly fastened in place.

C. Subsequent watering - Seed shall be watered as required to maintain adequate moisture in the soil. In the absence of rainfall, seed shall be watered at frequencies dictated by need.

3.4 ACCEPTANCE

A. Inspection of the work of seeding to determine provisional acceptance will be made by the Architect upon written notice requesting such inspection submitted by the contractor at least seven (7) days prior to the anticipated date of inspection. Request may be made subsequent to the second mowing of the turf.

B. After inspection the contractor will be notified in writing by the Architect of provisional acceptance of all work, or if there are any deficiencies of the requirements for completion of the work.

C. All seeded areas shall be guaranteed for one (l) growing season commencing with the date of provisional acceptance.

END OF SECTION

APPENDIX

Eisenbach & Ruhnke
ENGINEERING, P.C.

LIMITED ASBESTOS SURVEY

Edgemont Central School District
Greenville Elementary School
100 Glendale Road
Scarsdale, NY 10583

Project Name: Cafeteria Renovation and Related Work

Issued : March 24, 2022

Prepared For:

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Matthew Inman
Manager of Environmental Services AH97-21978

E&R Project # 14-21-04

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APPENDICES

1.0 TESTING SUMMARY

Eisenbach and Ruhnke Engineering, P.C. (E&R) was retained by Fuller and D'Angelo (F&D) to perform a Limited Asbestos Survey at the Edgemont High School, located in Scarsdale, NY. The survey was performed on the following dates by Matthew Inman (New York State Accredited Inspector, Number 97-21978) and Patrick Baker (New York State Accredited Inspector 13-10438).

Inspector	License #	Date of Inspection
Matthew Inman	97-21978	November 18, 2021
Patrick Baker	13-10438	November 18, 2021
Matthew Inman	97-21978	January 12, 2022
Patrick Baker	13-10438	February 16, 2022

All work was completed in compliance with New York State Department of Labor 12 NYCRR Part 56, 40 CFR part 763, Subpart –E requirements, and U.S.E.P.A. 40 CFR 61 NESHAP, Subpart-M requirements.

The survey was completed for the project titled "Cafeteria Renovation and Related Work". The project involves renovations to the Cafeteria areas, as well as an addition to the building. The survey included the renovation areas and all associated materials that would be impacted by the scope of work. All other areas of the building were not inspected as part of this survey.

The survey limitations, methods, analysis, findings, and list of asbestos containing materials with locations and quantities are included herein.

2.0 LIMITATIONS/METHODS AND ANALYSIS

The purpose of the survey is to identify approximate locations and quantities of asbestos containing materials. The inspection did not include destructive testing to determine if any materials were buried behind walls or above fixed ceilings. The inspection included all materials that were accessible during the time of the inspection. This survey is not intended for the purposes of planning the scope, timing, phasing, and/or remediation methods on any asbestos containing materials identified herein. The Owner and/or their representatives are responsible for verifying exact quantities, types, and locations prior to any renovation or demolition work.

All samples were analyzed per New York State Environmental Laboratory Protocol (NYS ELAP). Friable bulk samples were analyzed using the Polarized Light Microscopy (PLM) NYS ELAP Method 198.1. Non-friable organically bound samples were analyzed utilizing gravimetric reduction with PLM analysis (NYS ELAP Method 198.6) and Transmission Electron Microscopy (TEM) confirmation of all PLM negatives (NYS ELAP Method 198.4).

3.0 FINDINGS

A. Asbestos-Containing Materials (ACM)

The following materials were tested and found to be asbestos containing. Asbestos-containing materials are materials that contain more than 1% asbestos.

1. Thermal System Insulation

   Duct Insulation

   Pipe Insulation

2. Surfacing Materials

   None.

3. Miscellaneous Materials

   Sink Mastic

4.0 LOCATIONS AND QUANTITES OF ACM

All quantities listed are estimated; see Appendix B for location of Spaces

Material	Homogeneous Material ID	Location	Quantity
Sink Mastic	4	Kitchen	1 Sink
Duct Insulation	14	Storage Room	125 SQ FT
Pipe Insulation	15-18	Storage Room	52 LN FT

APPENDIX A

SAMPLE LOG/HOMOGENEOUS MATERIAL LIST

Eisenbach & Ruhnke
ENGINEERING, P.C.

AmeriSci Job # 221113083

Edgemont CSD
Greenville Elementary
100 Glendale Road
Scarsdale, NY 10583

Project No. 14-21-04

SAMPLE #	PLM RESULTS	TEM RESULTS	HOMO ID#	MATERIAL SAMPLED	SAMPLE LOCATION
GR0001	NAD	NAD	1	1x1 Wall Tile Mastic - Brown	Cafeteria
GR0002	NAD	NAD	1	1x1 Wall Tile Mastic - Brown	Cafeteria
GR0003	NAD	NAD	2	1x1 Wall Tile	Cafeteria
GR0004	NAD	NAD	2	1x1 Wall Tile	Cafeteria
GR0005	NAD	NA	3	Concrete Block Filler	Stage
GR0006	NAD	NA	3	Concrete Block Filler	Stage
GR0007	**7.3% ACM**	**NA**	4	**Sink Mastic - Black**	**Kitchen**
GR0008	**NA/PS**	**NA**	4	**Sink Mastic - Black**	**Kitchen**
GR0009	NAD	NAD	5	1x1 Floor Tile Mastic - Yellow	Kitchen
GR0010	NAD	NAD	5	1x1 Floor Tile Mastic - Yellow	Kitchen
GR0011	NAD	NAD	6	1x1 Floor Tile - Gray	Kitchen
GR0012	NAD	NAD	6	1x1 Floor Tile - Gray	Kitchen
GR0013	NAD	NAD	7	2x2 Ceiling Tile	Cafeteria
GR0014	NAD	NAD	7	2x2 Ceiling Tile	Cafeteria
GR0015	NAD	NAD	8	Door Caulk - Gray	Exterior
GR0016	NAD	NAD	8	Door Caulk - Gray	Exterior
GR0017	NAD	NA	9	Spray-On Insulation	Stage
GR0018	NAD	NA	9	Spray-On Insulation	Stage
GR0019	NAD	NA	9	Spray-On Insulation	Stage
GR0020	NAD	NA	10	Gypsum Wallboard	Stage
GR0021	NAD	NA	10	Gypsum Wallboard	Stage
GR0022	NAD	NA	11	Joint Compound	Stage
GR0023	NAD	NA	11	Joint Compound	Stage
GR0024	NAD	NAD	12	Covebase Mastic - Tan	Kitchen
GR0025	NAD	NAD	13	4" Covebase - Gray	Kitchen
GR0026	NAD	NAD	12	Covebase Mastic - Tan	Kitchen
GR0027	NAD	NAD	13	4" Covebase - Gray	Kitchen

LEGEND

ACM = Asbestos Containing Material - Contains Greater than 1% asbestos by weight.

Trace = Asbestos was NOT detected above the regulatory limit of 1% by weight.

NAD = No Asbestos Detected

NA/PS = Sample was not analyzed, but is grouped with another that tested positive for asbestos.

NA = Sample was not analyzed. Either a NOB sample that tested positive under PLM, or a friable sample that is not analyzed by TEM.

Samples Collected: 11.18.21
Samples Collected by: Matt Inman
NYS Accredited Inspector #: 97-21978

AmeriSci Job # 222011943

Edgemont CSD
Greenville Elementary
100 Glendale Road
Scarsdale, NY 10583

Project No. 14-21-04

SAMPLE #	PLM RESULTS	TEM RESULTS	HOMO ID#	MATERIAL SAMPLED	SAMPLE LOCATION
GR028	57.1% ACM	NA	14	Duct Insulation	Basement Storage
GR029	NA/PS	NA	14	Duct Insulation	Basement Storage
GR030	NA/PS	NA	14	Duct Insulation	Basement Storage
GR031	66.7% ACM	NA	15	Pink Pipe Insulation	Basement Storage
GR032	NA/PS	NA	15	Pink Pipe Insulation	Basement Storage
GR033	NA/PS	NA	15	Pink Pipe Insulation	Basement Storage
GR034	10% ACM	NA	16	Blue Pipe Insulation	Basement Storage
GR035	NA/PS	NA	16	Blue Pipe Insulation	Basement Storage
GR036	NA/PS	NA	16	Blue Pipe Insulation	Basement Storage
GR037	20% ACM	NA	17	Green Pipe Insulation	Basement Storage
GR038	NA/PS	NA	17	Green Pipe Insulation	Basement Storage
GR039	NA/PS	NA	17	Green Pipe Insulation	Basement Storage
GR040	16% ACM	NA	18	Yellow Pipe Insulation	Basement Storage
GR041	NA/PS	NA	18	Yellow Pipe Insulation	Basement Storage
GR042	NA/PS	NA	18	Yellow Pipe Insulation	Basement Storage

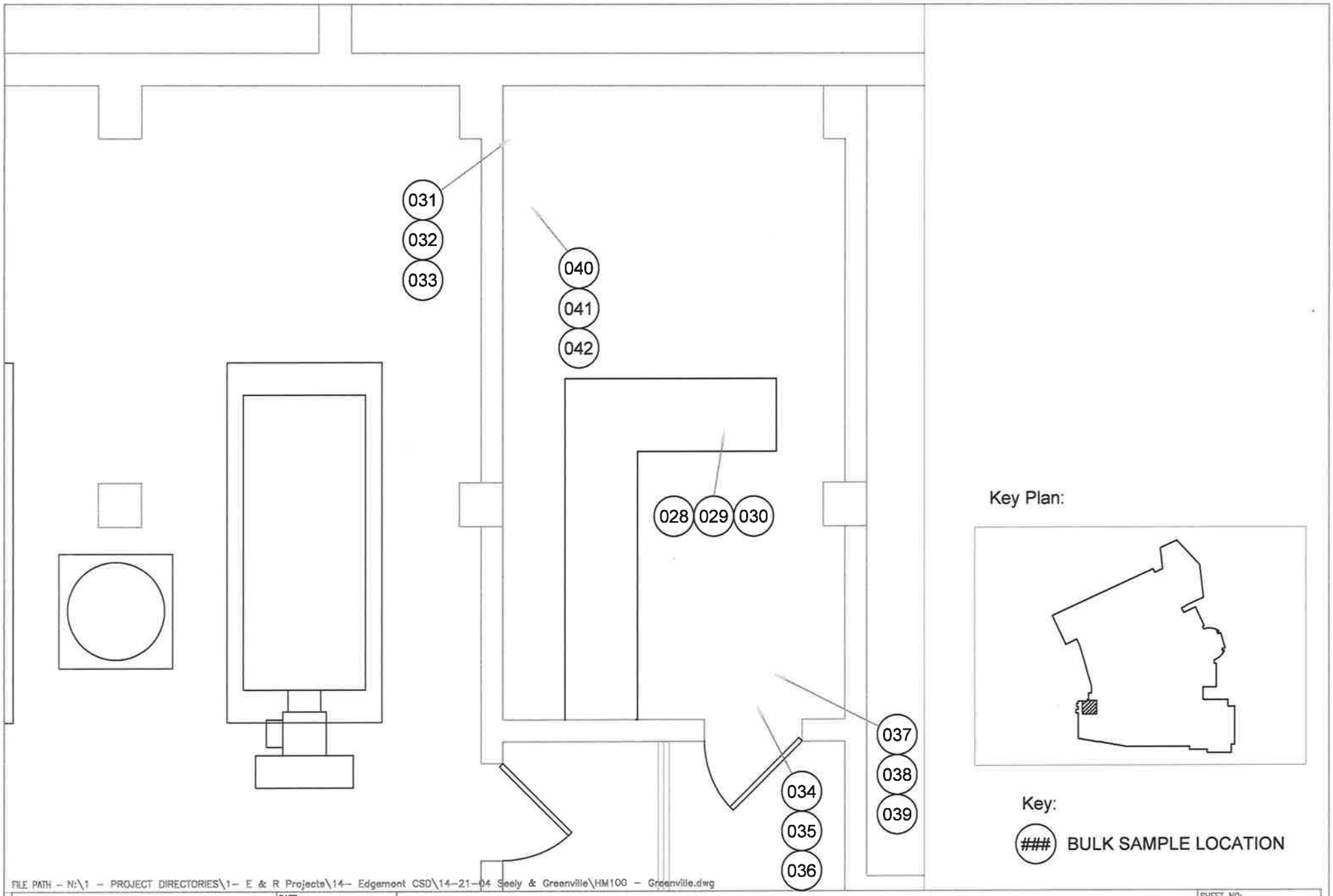
LEGEND

ACM = Asbestos Containing Material - Contains Greater than 1% asbestos by weight.
Trace = Asbestos was NOT detected above the regulatory limit of 1% by weight.
NAD = No Asbestos Detected
NA/PS = Sample was not analyzed, but is grouped with another that tested positive for asbestos.
NA = Sample was not analyzed. Either a NOB sample that tested positive under PLM, or a friable sample that is not analyzed by TEM.

Samples Collected: 1.12.22
Samples Collected by: Matt Inman
NYS Accredited Inspector #: 97-21978

APPENDIX B

DRAWINGS SHOWING SAMPLE LOCATIONS



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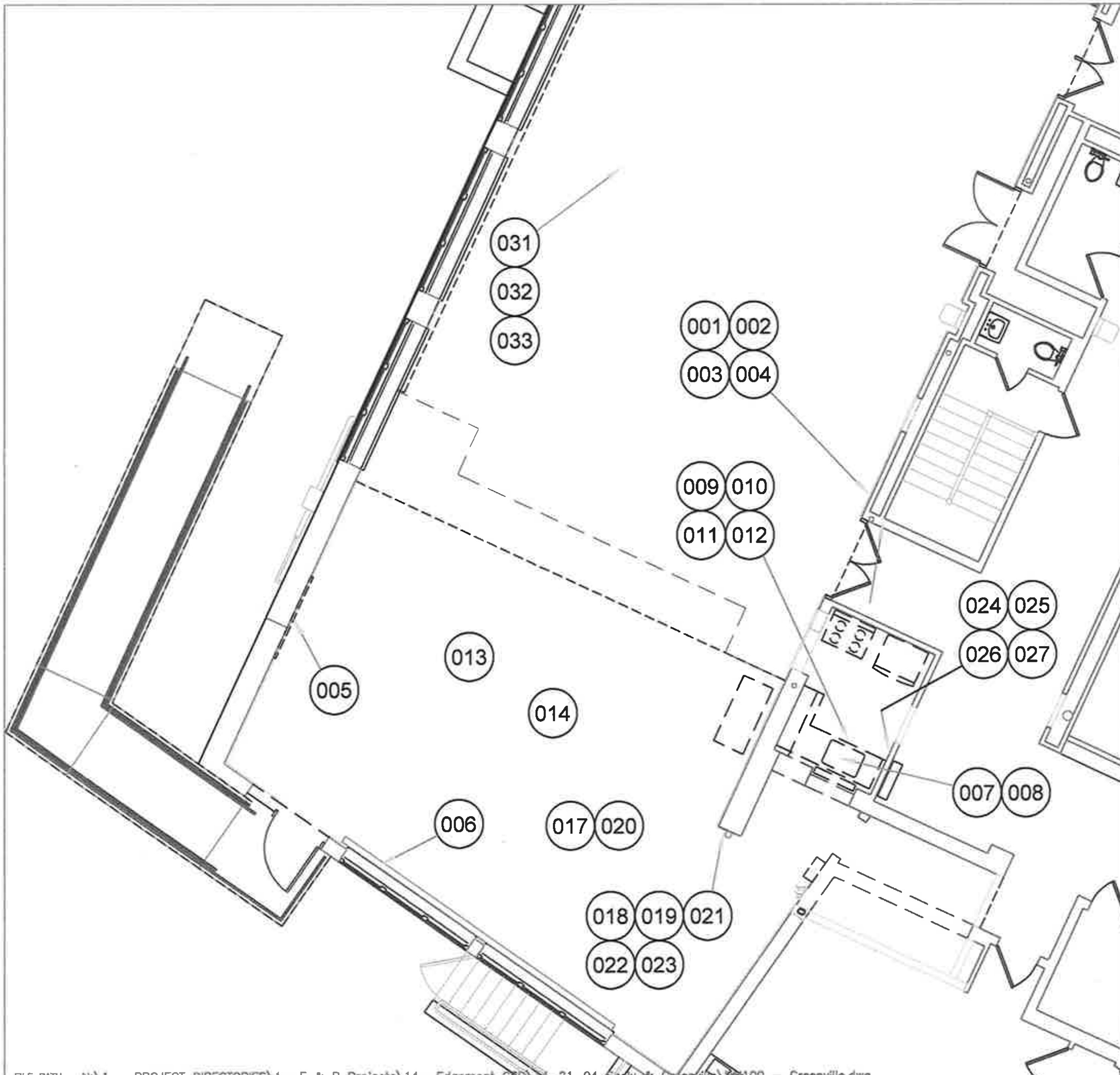
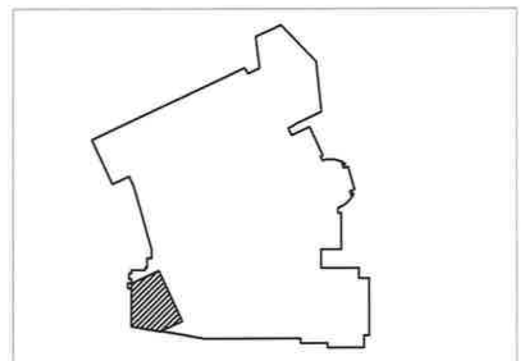
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street – Utica, NY 13501 Ph: 315–735–1916
Fax: 315–735–6365 www.erengpc.com

DATE: 3/25/22
SCALE: NTS
PROJECT NO: 14–21–04
DRAWN BY: MCI

EDGEMONT CSD
GREENVILLE ELEMENTARY
BULK SAMPLE LOCATION PLAN - BASEMENT

SHEET NO: Figure 1





Key Plan:

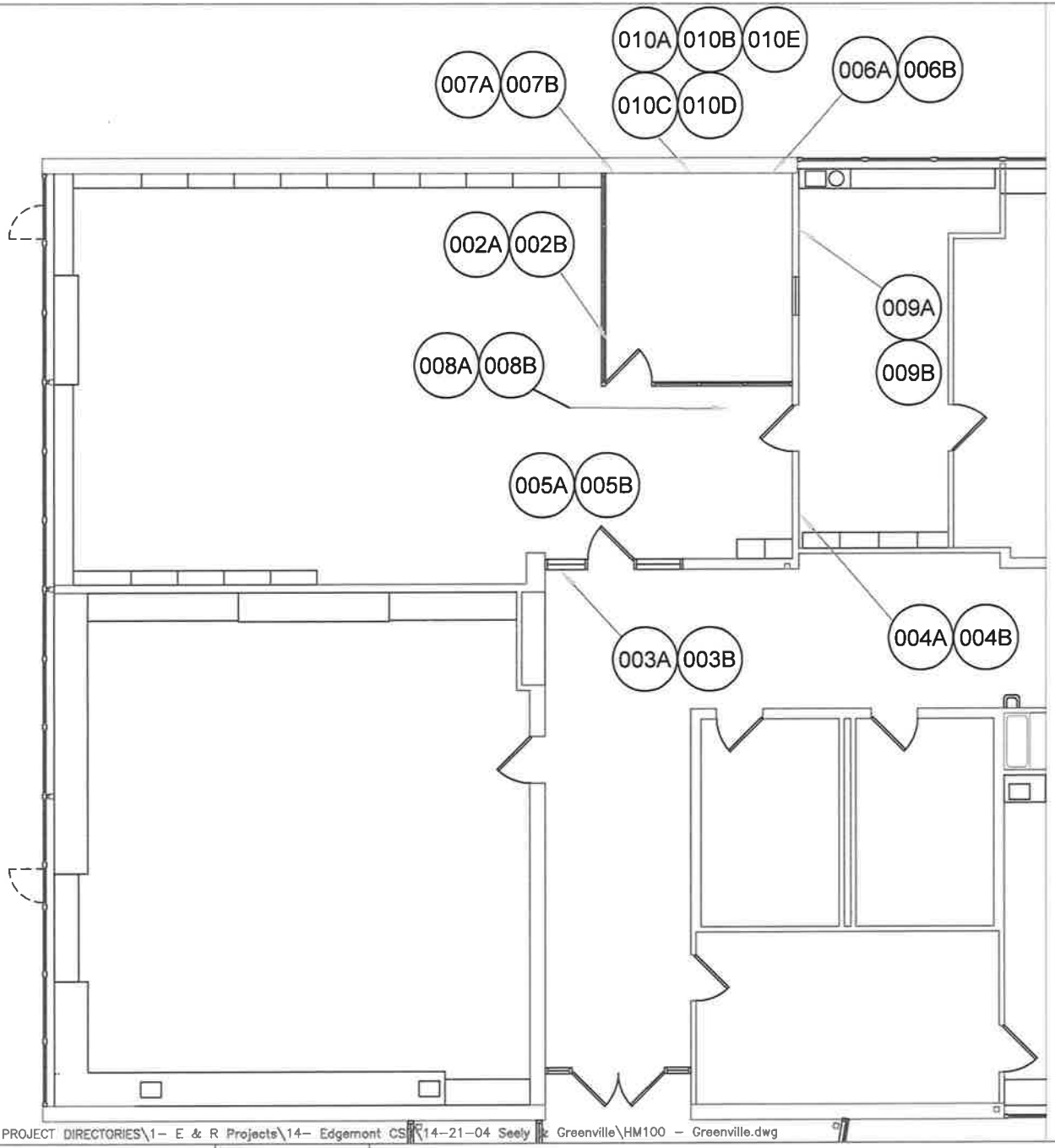
Key:

BULK SAMPLE LOCATION

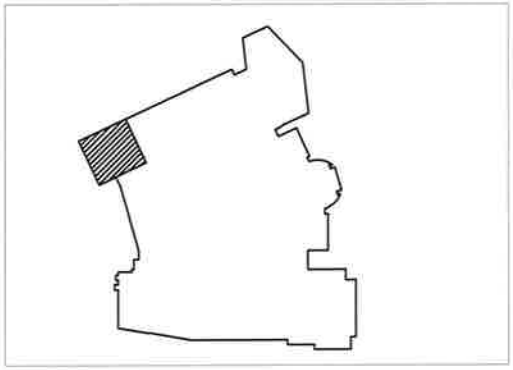
FILE PATH – N:\1 – PROJECT DIRECTORIES\1– E & R Projects\14– Edgemont CSD\14–21–04 Sealy & Greenville\M100 – Greenville.dwg

Eisenbach & Ruhnke Engineering, P.C. 291 Genesee Street – Utica, NY 13501 Ph: 315-735-1916 Fax: 315-735-6365 www.erengpc.com	DATE: 3/25/22 SCALE: NTS PROJECT NO: 14-21-04 DRAWN BY: MCI	EDGEMONT CSD GREENVILLE ELEMENTARY BULK SAMPLE LOCATION PLAN - 1ST FL CAFETERIA

SHEET NO: Figure 2



Key Plan:



Key:

BULK SAMPLE LOCATION

FILE PATH – N:\1 – PROJECT DIRECTORIES\1– E & R Projects\14– Edgemont CSD\14–21–04 Seely & Greenville\HM100 – Greenville.dwg

Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street – Utica, NY 13501 Ph: 315–735–1916
Fax: 315–735–6365 www.erengpc.com

DATE: 3/25/22
SCALE: NTS
PROJECT NO: 14–21–04
DRAWN BY: MCI

EDGEMONT CSD
GREENVILLE ELEMENTARY
BULK SAMPLE LOCATION PLAN - PROPOSED ADDITION

SHEET NO:
Figure 3

APPENDIX C

LABORATORY ANALYSIS RESULTS

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: 2126798600 FAX: 2126793114

November 29, 2021

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street
Utica, NY 13501

RE: Eisenbach & Ruhnke Engineering, P.C.
Job Number 221113083
P.O. #14-21-04
14-21-04; Fuller And D'Angelo Arch.; Greenville Elem. (Edgemont)

Dear Jack Eisenbach:

Enclosed are the results of Asbestos Analysis - Bulk Protocol of the following Eisenbach & Ruhnke Engineering, P.C. samples, received at AmeriSci on Tuesday, November 23, 2021, for a 3 day turnaround:

GR0001, GR0002, GR0003, GR0004, GR0005, GR0006, GR0007, GR0008, GR0009, GR010, GR011, GR012, GR013, GR014, GR015, GR016, GR017, GR018, GR019, GR020, GR021, GR022, GR023, GR024, GR025, GR026, GR027

The 27 samples, placed in Zip Lock Bag, were shipped to AmeriSci via Hand Delivered. Eisenbach & Ruhnke Engineering, P.C. requested ELAP PLM/TEM analysis of these samples.

The results of the analyses which were performed following ELAP Protocols 198.1 PLM Friable and/or 198.6 for PLM NOB. ELAP Protocol 198.4 TEM NOB guidelines are presented within the Summary Table of this report. The presence of matrix reduction data in the Summary Table normally indicates an NOB sample. For NOB samples the individual matrix reduction, combined PLM and TEM analysis results are listed in the Summary Bulk Asbestos Analysis Results in Table I. Complete PLM results for individual samples are presented in the PLM Bulk Asbestos Report. Samples near 1% asbestos may be analyzed by EPA 400 pt ct method (EPA 600-M4-82-020). This combined report relates ONLY to sample analysis expressed as percent composition by weight and percent asbestos. This report must not be used to claim product endorsement or approval by these laboratories, NVLAP, ELAP or any other associated agency. This report must not be reproduced, except in full without the written approval of the laboratory. This report may contain specific data not covered by NVLAP or ELAP accreditations respectively, if so identified in relevant footnotes.

AmeriSci appreciates this opportunity to serve your organization. Please contact us for any further assistance or with any questions.

Sincerely,

Paul J. Mucha
Lab. Dir | Authorized Signatory

RECEIVED
DEC 2021
BY: .....

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

PLM Bulk Asbestos Report

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street

Utica, NY 13501

Date Received 11/23/21
Date Examined 11/26/21
ELAP # 11480
AmeriSci Job # 221113083
P.O. #
Page 1 **of** 5
RE: 14-21-04; Fuller And D'Angelo Arch.; Greenville Elem. (Edgemont)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GR0001 1	221113083-01 **Location:** Cafeteria, 1x1 Wall Tile Mastic - Brn	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 42.7%			
GR0002 1	221113083-02 **Location:** Cafeteria, 1x1 Wall Tile Mastic - Brn	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 44.2%			
GR0003 2	221113083-03 **Location:** Cafeteria, 1x1 Wall Tile	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: White/Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 24.6%			
GR0004 2	221113083-04 **Location:** Cafeteria, 1x1 Wall Tile	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: White/Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 22.1%			
GR0005 3	221113083-05 **Location:** Stage, Concrete Block Filler	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/26/21
Analyst Description: White/Beige, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-04; Fuller And D'Angelo Arch.; Greenville Elem. (Edgemont)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GR0006 3	221113083-06 **Location:** Stage, Concrete Block Filler	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/26/21
Analyst Description: White/Beige, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%			
GR0007 4	221113083-07 **Location:** Kitchen, Sink Mastic - Blk	***Yes***	7.3% (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 7.3 % **Other Material:** Non-fibrous 25.6%			
GR0008 4	221113083-08 **Location:** Kitchen, Sink Mastic - Blk		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
GR0009 5	221113083-09 **Location:** Kitchen, 1x1 Floor Tile Mastic - Yellow	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Tan/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 12.6%			
GR010 5	221113083-10 **Location:** Kitchen, 1x1 Floor Tile Mastic - Yellow	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Tan/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10.7%			
GR011 6	221113083-11 **Location:** Kitchen, 1x1 Floor Tile - Gray	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Gold, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.9%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-04; Fuller And D'Angelo Arch.; Greenville Elem. (Edgemont)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GR012 6	221113083-12 **Location:** Kitchen, 1x1 Floor Tile - Gray	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.8%			
GR013 7	221113083-13 **Location:** Cafeteria, 2x2 Ceiling Tile	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: White/Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 32.4%			
GR014 7	221113083-14 **Location:** Cafeteria, 2x2 Ceiling Tile	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: White/Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 47.5%			
GR015 8	221113083-15 **Location:** Exterior, Door Caulk - Gray	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.2%			
GR016 8	221113083-16 **Location:** Exterior, Door Caulk - Gray	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.4%			
GR017 9	221113083-17 **Location:** Stage, Spray-On	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/26/21
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 95%, Non-fibrous 5%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-04; Fuller And D'Angelo Arch.; Greenville Elem. (Edgemont)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GR018 9	221113083-18 **Location:** Stage, Spray-On	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/26/21
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 93%, Non-fibrous 7%			
GR019 9	221113083-19 **Location:** Stage, Spray-On	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/26/21
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Non-fibrous 10%			
GR020 10	221113083-20 **Location:** Stage, Gypsum Wallboard	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/26/21
Analyst Description: Brown/Gray, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 5%, Fibrous glass 1%, Non-fibrous 94%			
GR021 10	221113083-21 **Location:** Stage, Gypsum Wallboard	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/26/21
Analyst Description: Black/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 25%, Fibrous glass Trace, Non-fibrous 75%			
GR022 11	221113083-22 **Location:** Stage, Joint Compound	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/26/21
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%			
GR023 11	221113083-23 **Location:** Stage, Joint Compound	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/26/21
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-04; Fuller And D'Angelo Arch.; Greenville Elem. (Edgemont)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GR024 12	221113083-24 **Location:** Kitchen, Covebase Mastic - Tan	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.6%			
GR025 13	221113083-25 **Location:** Kitchen, 4" Covebase - Gray	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.3%			
GR026 12	221113083-26 **Location:** Kitchen, Covebase Mastic - Tan	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.3%			
GR027 13	221113083-27 **Location:** Kitchen, 4" Covebase Gray	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/26/21
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.3%			

Reporting Notes:

Analyzed by: Valeriu Voicu
Date: 11/26/2021

Reviewed by: Gabriella Morozov

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

END OF REPORT

AmeriSci Job #: **221113083**

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I
Summary of Bulk Asbestos Analysis Results

14-21-04; Fuller And D'Angelo Arch.; Greenville Elem. (Edgemont)

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	GR0001	1	0.564	52.3	5.0	42.7	NAD	NAD
Location: Cafeteria, 1x1 Wall Tile Mastic - Brn								
02	GR0002	1	0.318	53.5	2.3	44.2	NAD	NAD
Location: Cafeteria, 1x1 Wall Tile Mastic - Brn								
03	GR0003	2	0.351	65.3	10.1	24.6	NAD	NAD
Location: Cafeteria, 1x1 Wall Tile								
04	GR0004	2	0.265	75.3	2.6	22.1	NAD	NAD
Location: Cafeteria, 1x1 Wall Tile								
05	GR0005	3	----	----	----	----	NAD	NA
Location: Stage, Concrete Block Filler								
06	GR0006	3	----	----	----	----	NAD	NA
Location: Stage, Concrete Block Filler								
07	GR0007	4	0.279	40.3	26.7	25.6	Chrysotile 7.3	NA
Location: Kitchen, Sink Mastic - Blk								
08	GR0008	4	0.213	41.7	43.5	14.8	NA/PS	NA
Location: Kitchen, Sink Mastic - Blk								
09	GR0009	5	0.212	50.4	37.0	12.6	NAD	NAD
Location: Kitchen, 1x1 Floor Tile Mastic - Yellow								
10	GR010	5	0.236	54.5	34.9	10.7	NAD	NAD
Location: Kitchen, 1x1 Floor Tile Mastic - Yellow								
11	GR011	6	0.321	16.2	80.0	3.9	NAD	NAD
Location: Kitchen, 1x1 Floor Tile - Gray								
12	GR012	6	0.366	15.2	81.0	3.8	NAD	NAD
Location: Kitchen, 1x1 Floor Tile - Gray								
13	GR013	7	0.754	9.6	58.0	32.4	NAD	NAD
Location: Cafeteria, 2x2 Ceiling Tile								
14	GR014	7	0.363	15.2	37.3	47.5	NAD	NAD
Location: Cafeteria, 2x2 Ceiling Tile								
15	GR015	8	0.246	50.0	44.7	5.2	NAD	NAD
Location: Exterior, Door Caulk - Gray								
16	GR016	8	0.225	50.7	43.9	5.4	NAD	NAD
Location: Exterior, Door Caulk - Gray								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
14-21-04; Fuller And D'Angelo Arch.; Greenville Elem. (Edgemont)

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	GR017	9	----	----	----	----	NAD	NA
Location: Stage, Spray-On								
18	GR018	9	----	----	----	----	NAD	NA
Location: Stage, Spray-On								
19	GR019	9	----	----	----	----	NAD	NA
Location: Stage, Spray-On								
20	GR020	10	----	----	----	----	NAD	NA
Location: Stage, Gypsum Wallboard								
21	GR021	10	----	----	----	----	NAD	NA
Location: Stage, Gypsum Wallboard								
22	GR022	11	----	----	----	----	NAD	NA
Location: Stage, Joint Compound								
23	GR023	11	----	----	----	----	NAD	NA
Location: Stage, Joint Compound								
24	GR024	12	0.424	43.6	48.8	7.6	NAD	NAD
Location: Kitchen, Covebase Mastic - Tan								
25	GR025	13	0.321	55.8	41.8	2.3	NAD	NAD
Location: Kitchen, 4" Covebase - Gray								
26	GR026	12	0.396	45.5	48.2	6.3	NAD	NAD
Location: Kitchen, Covebase Mastic - Tan								
27	GR027	13	0.287	54.4	43.3	2.3	NAD	NAD
Location: Kitchen, 4" Covebase Gray								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
14-21-04; Fuller And D'Angelo Arch.; Greenville Elem. (Edgemont)

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

Analyzed by: Gabriella Morozov
Date: 11/27/2021

Reviewed by: Gabriella Morozov

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315-735-1916 · FAX 315-735-6365 · E-MAIL info@ereng.com

#2 2111308

BULK SAMPLE LOG ASBESTOS

Log No: ____of____

CLIENT: Fuller and D'Angelo Arch.	ANALYSIS: ☐ PLM Only ☐ TEM Only ☒ PLM/TEM as required by ELAP ☐ Other _____
PROJECT NAME/LOCATION: Greenville Elem. (Edgemont)	
SAMPLES COLLECTED BY: Matt Inman	
NYS DEPT OF LABOR CERTIFICATE NO. 97-21978	TURNAROUND TIME: ☐ RUSH ☐ 12 Hour ☐ 24 HOUR ☐ 48 Hour ☒ 72 Hour ☐ Other_____
DATE SAMPLED: 11/18/21 PROJECT#: 14-24-04	

NOTES:

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
GR001	1	1X1 Wall Tile Mastic - BRN	Cafeteria	002-004
002	1	↓ ↓ ↓ ↓	↓	003-004
003	2	1X1 Wall Tile	↓	004
004	2	↓ ↓	↓	
005	3	Concrete Block Filler	Stage	006
006	3	↓ ↓ ↓	↓	
007	4	Sink Mastic - BLK	Kitchen	008
008	4	↓ ↓	↓	
009	5	1X1 Floor Tile Mastic - Yellow	Kitchen	010-012
010	5	↓ ↓	↓	011-012
011	6	1X1 Floor Tile - Gray	↓	012
012	6	↓ ↓ ↓	↓	
013	7	2x2 ceiling Tile	Cafeteria	014
014	7	↓ ↓	↓	
015	8	Door Caulk - Gray	Exterior	016
016	8	↓ ↓ ↓	↓	
017	9	Spray-On	Stage	018, 019
018	9	↓ ↓	↓	019
019	9	↓ ↓	↓	

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Matt Inman	Matthew Inman	ERE	11/22/21	19
Received by:	Efrain Nunez	Efrain Nunez	Amerisc	11/23/21	19

PLEASE EMAIL RESULTS TO minman @ erengpc.com ATTN: Matt

PLEASE FAX RESULTS TO ( ) - ATTN:

EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315·735·1916 · FAX 315·735·6365 · E-MAIL info@ereng.com

#2211130 83

BULK SAMPLE LOG
ASBESTOS
Log No: ____of____

CLIENT: Fuller and D'Angelo Arch.	ANALYSIS: ☐ PLM Only ☐ TEM Only ☒ PLM/TEM as required by ELAP ☐ Other _____
PROJECT NAME/LOCATION: Greenville Elem. (Edgemont)	
SAMPLES COLLECTED BY: Matt Inman	
NYS DEPT OF LABOR CERTIFICATE NO. 97-21978	TURNAROUND TIME: ☐ **RUSH** ☐ 12 Hour ☐ 24 HOUR ☐ 48 Hour ☒ 72 Hour ☐ Other_____
DATE SAMPLED: 11/18/21 PROJECT#: 14-21-04	

NOTES:

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
GR 020	10	Gypsum Wallboard	Stage	021-023
021	10	↓ ↓	↓	022, 023
022	11	Joint Compound		023
023	11	↓ ↓	↓	
024	12	Covebase Mastic - TAN	Kitchen	025-027
025	13	4" Covebase - GRAY	↓	026-027
026	12	Covebase Mastic - TAN		027
↓ 027	13	4" Covebase Gray	↓	

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Matt Inman		EAR	11/22/21	8
Received by:	Efrain Nunez		Ameresco	11/23/21	8

PLEASE EMAIL RESULTS TO minman @ereng pc. com **ATTN:** Matt

PLEASE FAX RESULTS TO ( ) - ATTN:

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: 2126798600 FAX: 2126793114

January 17, 2022

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street
Utica, NY 13501

RE: Eisenbach & Ruhnke Engineering, P.C.
Job Number 222011943
P.O. #14-21-04
14-21-04; Fuller + D'Angelo; Edgemont CSD Greenville Elem.

Dear Jack Eisenbach:

Enclosed are the results of Asbestos Analysis - Bulk Protocol of the following Eisenbach & Ruhnke Engineering, P.C. samples, received at AmeriSci on Friday, January 14, 2022, for a 3 day turnaround:

028, 029, 030, 031, 032, 033, 034, 035, 036, 037, 038, 039, 040, 041, 042

The 15 samples, placed in Zip Lock Bag, were shipped to AmeriSci via Fed Ex. Eisenbach & Ruhnke Engineering, P.C. requested ELAP PLM analysis of these samples.

The results of the analyses which were performed under ELAP guidelines are presented within the attached sections of this report. This report relates ONLY to PLM analysis portions of ELAP 198.1, 198.6 or 198.4 expressed as percent by weight and percent asbestos. Samples near 1% asbestos may be analyzed by EPA 400 pt ct method (EPA 600-M4-82-020). Lack of matrix reduction data normally indicates a friable sample. The client is responsible for requesting TEM evaluation of sample inert residue if required by ELAP 198.6 or 198.4. This report must not be used to claim product endorsement or approval by these laboratories, NVLAP, ELAP or any other associated certifying agency. This report must not be reproduced, except in full without the written approval of the laboratory. This report may contain specific data not covered by NVLAP or ELAP accreditations respectively, if so identified in relevant footnotes.

AmeriSci appreciates this opportunity to serve your organization. Please contact us for any further assistance or with any questions.

Sincerely,

Paul J. Mucha
Lab. Dir | Authorized Signatory

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

PLM Bulk Asbestos Report

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street

Utica, NY 13501

Date Received 01/14/22
Date Examined 01/17/22
ELAP # 11480

AmeriSci Job # 222011943
P.O. #
Page 1 **of** 3

RE: 14-21-04; Fuller + D'Angelo; Edgemont CSD Greenville Elem.

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
028 1	222011943-01 **Location:** Basement Storage - Duct Insul.	*Yes*	57.1% (by NYS ELAP 198.1) by Ivan H. Reyes on 01/17/22
Analyst Description: Gray, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 57.1 % **Other Material:** Cellulose 10%, Non-fibrous 32.9%			
029 1	222011943-02 **Location:** Basement Storage - Duct Insul.		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
030 1	222011943-03 **Location:** Basement Storage - Duct Insul.		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
031 2	222011943-04 **Location:** Basement Storage - Pink Pipe Insul.	*Yes*	66.7% (by NYS ELAP 198.1) by Ivan H. Reyes on 01/17/22
Analyst Description: Gray, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 66.7 % **Other Material:** Cellulose 5%, Non-fibrous 28.3%			
032 2	222011943-05 **Location:** Basement Storage - Pink Pipe Insul.		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-04; Fuller + D'Angelo; Edgemont CSD Greenville Elem.

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
033 2	222011943-06 **Location:** Basement Storage - Pink Pipe Insul.		NA/PS
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
034 3	222011943-07 **Location:** Basement Storage - Blue Pipe Insul.	***Yes***	10% (by NYS ELAP 198.1) by Ivan H. Reyes on 01/17/22
	Analyst Description: Blue/Brown/Grey, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 10.0 % **Other Material:** Cellulose 75%, Non-fibrous 15%		
035 3	222011943-08 **Location:** Basement Storage - Blue Pipe Insul.		NA/PS
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
036 3	222011943-09 **Location:** Basement Storage - Blue Pipe Insul.		NA/PS
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
037 4	222011943-10 **Location:** Basement Storage - Green Pipe Insul.	***Yes***	20% (by NYS ELAP 198.1) by Ivan H. Reyes on 01/17/22
	Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 5.0 %, Amosite 15.0 % **Other Material:** Non-fibrous 80%		
038 4	222011943-11 **Location:** Basement Storage - Green Pipe Insul.		NA/PS
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-04; Fuller + D'Angelo; Edgemont CSD Greenville Elem.

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
0394	222011943-12		NA/PS
	Location: Basement Storage - Green Pipe Insul.		
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
0405	222011943-13	***Yes***	16% (by NYS ELAP 198.1) by Ivan H. Reyes on 01/17/22
	Location: Basement Storage - Yellow Pipe Insul.		
	Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 12.0 %, Amosite 4.0 % **Other Material:** Non-fibrous 84%		
0415	222011943-14		NA/PS
	Location: Basement Storage - Yellow Pipe Insul.		
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
0425	222011943-15		NA/PS
	Location: Basement Storage - Yellow Pipe Insul.		
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		

Reporting Notes:

Analyzed by: Ivan H. Reyes
Date: 1/17/2022

Reviewed by: Ivan H. Reyes

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315-735-1916 · FAX 315-735-6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS
Log No: ____of____

CLIENT: Fuller + D'Angelo	ANALYSIS: ☐ PLM Only ☐ TEM Only ☒ PLM/TEM as required by ELAP ☐ Other _____
PROJECT NAME/LOCATION: Edgemont CSD Greenville Elem.	
SAMPLES COLLECTED BY: Matt Inman	
NYS DEPT OF LABOR CERTIFICATE NO. 97-21978	TURNAROUND TIME: ☐ RUSH ☐ 12 Hour ☐ 24 HOUR
DATE SAMPLED: 1/12/22 PROJECT#: 14-21-04	☐ 48 Hour ☒ 72 Hour ☐ Other_____

NOTES:

222011943

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
028		Duct Insul.	Basement Storage	029, 030
029		↓	↓	030
030		↓	↓	
031		Pink Pipe Insul.		032, 033
032		↓	↓	033
033		↓	↓	
034		Blue Pipe Insul.		035, 036
035		↓	↓	036
036		↓	↓	
037		Green Pipe Insul.		038, 039
038.		↓	↓	039
039.		↓	↓	
040		Yellow Pipe Insul.		041, 042
041		↓	↓	042
042		↓	↓	

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Matt Inman	Matthew Inman	ER	1/13/22	15
Received by:	T Ligorg	T. L.	Amerisci NY	1/14/22 11:41	15

PLEASE EMAIL RESULTS TO Minman @ erengpc.com **ATTN:** Matt

PLEASE FAX RESULTS TO ( ) - ATTN:

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: 2126798600 FAX: 2126793114

February 23, 2022

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street
Utica, NY 13501

RE: Eisenbach & Ruhnke Engineering, P.C.
Job Number 222022759
P.O. #142104
142104; Greenville Elementary; 100 Glendale Rd, Scarsdale, NY

Dear Jack Eisenbach:

Enclosed are the results of Asbestos Analysis - Bulk Protocol of the following Eisenbach & Ruhnke Engineering, P.C. samples, received at AmeriSci on Monday, February 21, 2022, for a 24 hour turnaround:

001-A, 001-B, 002-A, 002-B, 003-A, 003-B, 004-A, 004-B, 005-A, 005-B, 006-A, 006-B, 007-A, 007-B, 008-A, 008-B, 009-A, 009B, 010-A, 010-B, 010-C, 010-D, 010-E

The 23 samples, placed in Zip Lock Bag, were shipped to AmeriSci via Fed Ex. Eisenbach & Ruhnke Engineering, P.C. requested ELAP PLM/TEM analysis of these samples.

The results of the analyses which were performed following ELAP Protocols 198.1 PLM Friable and/or 198.6 for PLM NOB. ELAP Protocol 198.4 TEM NOB guidelines are presented within the Summary Table of this report. The presence of matrix reduction data in the Summary Table normally indicates an NOB sample. For NOB samples the individual matrix reduction, combined PLM and TEM analysis results are listed in the Summary Bulk Asbestos Analysis Results in Table I. Complete PLM results for individual samples are presented in the PLM Bulk Asbestos Report. Samples near 1% asbestos may be analyzed by EPA 400 pt ct method (EPA 600-M4-82-020). This combined report relates ONLY to sample analysis expressed as percent composition by weight and percent asbestos. This report must not be used to claim product endorsement or approval by these laboratories, NVLAP, ELAP or any other associated agency. This report must not be reproduced, except in full without the written approval of the laboratory. This report may contain specific data not covered by NVLAP or ELAP accreditations respectively, if so identified in relevant footnotes.

AmeriSci appreciates this opportunity to serve your organization. Please contact us for any further assistance or with any questions.

Sincerely,

Paul J. Mucha
Lab. Dir | Authorized Signatory

RECEIVED
FEB 28 2022

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

PLM Bulk Asbestos Report

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street

Utica, NY 13501

Date Received 02/21/22
Date Examined 02/22/22
ELAP # 11480

AmeriSci Job # 222022759
P.O. #
Page 1 **of** 5

RE: 142104; Greenville Elementary; 100 Glendale Rd, Scarsdale, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
001-A 01	222022759-01 **Location:** Cafeteria - Black Block Coating	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: Gray/Black, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
001-B 01	222022759-02 **Location:** Cafeteria - Black Block Coating	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: Gray/Black, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
002-A 02	222022759-03L1 **Location:** Cream Color Tile	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.6%			
002-A 02	222022759-03L2 **Location:** Cream Color Tile / Mastic (Black/Brown)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Black/Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9%			
002-B 02	222022759-04L1 **Location:** Cream Color Tile	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

142104; Greenville Elementary; 100 Glendale Rd, Scarsdale, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
002-B 02	222022759-04L2 **Location:** Cream Color Tile / Mastic (Black/Brown)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Black/Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.4%			
003-A 03	222022759-05 **Location:** Hallway Mastic - Mastic (Black/Brown)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 14.1%			
003-B 03	222022759-06 **Location:** Hallway Mastic - Mastic (Black/Brown)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.8%			
004-A 04	222022759-07L1 **Location:** Cove Base	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17%			
004-A 04	222022759-07L2 **Location:** Cove Base / Mastic	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.6%			
004-B 04	222022759-08L1 **Location:** Cove Base	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.8%			

See Reporting notes on last page

PLM Bulk Asbestos Report

142104; Greenville Elementary; 100 Glendale Rd, Scarsdale, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
004-B 04	222022759-08L2 **Location:** Cove Base / Mastic	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.5%			
005-A 05	222022759-09 **Location:** 12 x 12 Wallboard Glue Puck (Brown)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 41.3%			
005-B 05	222022759-10 **Location:** 12 x 12 Wallboard Glue Puck (Brown)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 43.5%			
006-A 06	222022759-11 **Location:** Yellow Insulation	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: Yellow, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 90%, Non-fibrous 10%			
006-B 06	222022759-12 **Location:** Yellow Insulation	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: Yellow, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 90%, Non-fibrous 10%			
007-A 07	222022759-13 **Location:** Elbows (White)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 15%, Non-fibrous 85%			

See Reporting notes on last page

PLM Bulk Asbestos Report

142104; Greenville Elementary; 100 Glendale Rd, Scarsdale, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
007-B 07	222022759-14 **Location:** Elbows (White)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 15%, Non-fibrous 85%			
008-A 08	222022759-15 **Location:** Ceiling Tile	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 32.2%			
008-B 08	222022759-16 **Location:** Ceiling Tile	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 02/22/22
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 80.3%			
009-A 09	222022759-17 **Location:** Sheetrock (Brown/White Brown/Blue)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: White/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 30%, Non-fibrous 70%			
009B 09	222022759-18 **Location:** Sheetrock (Brown/White Brown/Blue)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: Brown/Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%			
010-A 10	222022759-19 **Location:** Plaster (Tan)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

142104; Greenville Elementary; 100 Glendale Rd, Scarsdale, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
010-B 10 **Location:** Plaster (Tan)	222022759-20	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
010-C 10 **Location:** Plaster (Tan)	222022759-21	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
010-D 10 **Location:** Plaster (Tan)	222022759-22	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
010-E 10 **Location:** Plaster (Tan)	222022759-23	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 02/22/22
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

Reporting Notes:

Analyzed by: Kensen Caro
Date: 2/22/2022

Reviewed by: Khaalid W. Perine

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229003, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

AmeriSci Job #: **222022759**

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I
Summary of Bulk Asbestos Analysis Results

142104; Greenville Elementary; 100 Glendale Rd, Scarsdale, NY

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	001-A	01	----	----	----	----	NAD	NA
Location: Cafeteria - Black Block Coating								
02	001-B	01	----	----	----	----	NAD	NA
Location: Cafeteria - Black Block Coating								
03L1	002-A	02	0.304	15.1	82.3	2.6	NAD	NAD
Location: Cream Color Tile								
03L2	002-A	02	0.287	39.2	51.8	9.0	NAD	NAD
Location: Cream Color Tile / Mastic (Black/Brown)								
04L1	002-B	02	0.249	15.3	81.5	3.3	NAD	NAD
Location: Cream Color Tile								
04L2	002-B	02	0.234	33.7	56.9	9.4	NAD	NAD
Location: Cream Color Tile / Mastic (Black/Brown)								
05	003-A	03	0.260	42.0	43.9	14.1	NAD	NAD
Location: Hallway Mastic - Mastic (Black/Brown)								
06	003-B	03	0.226	53.8	36.4	9.8	NAD	NAD
Location: Hallway Mastic - Mastic (Black/Brown)								
07L1	004-A	04	0.187	49.9	33.1	17.0	NAD	NAD
Location: Cove Base								
07L2	004-A	04	0.276	34.6	61.8	3.6	NAD	NAD
Location: Cove Base / Mastic								
08L1	004-B	04	0.205	46.5	51.8	1.8	NAD	NAD
Location: Cove Base								
08L2	004-B	04	0.307	34.4	58.1	7.5	NAD	NAD
Location: Cove Base / Mastic								
09	005-A	05	0.224	50.7	8.0	41.3	NAD	NAD
Location: 12 x 12 Wallboard Glue Puck (Brown)								
10	005-B	05	0.280	51.2	5.3	43.5	NAD	NAD
Location: 12 x 12 Wallboard Glue Puck (Brown)								
11	006-A	06	----	----	----	----	NAD	NA
Location: Yellow Insulation								
12	006-B	06	----	----	----	----	NAD	NA
Location: Yellow Insulation								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
142104; Greenville Elementary; 100 Glendale Rd, Scarsdale, NY

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
13	007-A	07	----	----	----	----	NAD	NA
Location: Elbows (White)								
14	007-B	07	----	----	----	----	NAD	NA
Location: Elbows (White)								
15	008-A	08	0.296	17.9	49.8	32.2	NAD	NAD
Location: Ceiling Tile								
16	008-B	08	0.127	17.5	2.1	80.3	NAD	NAD
Location: Ceiling Tile								
17	009-A	09	----	----	----	----	NAD	NA
Location: Sheetrock (Brown/White Brown/Blue)								
18	009B	09	----	----	----	----	NAD	NA
Location: Sheetrock (Brown/White Brown/Blue)								
19	010-A	10	----	----	----	----	NAD	NA
Location: Plaster (Tan)								
20	010-B	10	----	----	----	----	NAD	NA
Location: Plaster (Tan)								
21	010-C	10	----	----	----	----	NAD	NA
Location: Plaster (Tan)								
22	010-D	10	----	----	----	----	NAD	NA
Location: Plaster (Tan)								
23	010-E	10	----	----	----	----	NAD	NA
Location: Plaster (Tan)								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

142104; Greenville Elementary; 100 Glendale Rd, Scarsdale, NY

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

Analyzed by: Khaalid W. Perine
Date: 2/22/2022

Reviewed by: Khaalid W. Perine

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315·735·1916 · FAX 315·735·6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS
Log No: 1 of 1

CLIENT: Greenville Elemtary
PROJECT NAME/LOCATION: 100 Glendale Rd, Scarsdale, N.Y
SAMPLES COLLECTED BY: Pat Baker
NYS DEPT OF LABOR CERTIFICATE NO. 13-10438
DATE SAMPLED: 2/15/22 PROJECT#: 142104

ANALYSIS: ☐ PLM Only ☐ TEM Only ☐ PLM/TEM as required by ELAP ☐ Other _____

TURNAROUND TIME: ☐ **RUSH** ☐ 12 Hour ☒ 24 HOUR ☐ 48 Hour ☐ 72 Hour ☐ Other _____

NOTES: Stop at 1st Positive

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
001-A		Black Block Coating	Cafeteria	Sample
001-B		" Same "	"	Both
002-A		Cream color tile/mastic		Sample all
002-B		Black/Brown		
003-A		Mastic/Black/Brown	Hallway Mastic	Sample A
003-B				only
004-A		Cove Base/Mastic		Sample both
004-B		" "		
005-A		12x12 wall board		Sample A
005-B		Glue Puck		only
		Brown		
006 A		Yellow Insulation		Sample A
006 B		" "		only
		222022759		

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Pat Baker	Patrick Baker	E+R	2/15/22	2
Received by:	T Liang	T Liang	Ameri Sci NY	2/21/22 10:25	

PLEASE EMAIL RESULTS TO E+R and Abairtesting@gmail.com ATTN:

PLEASE FAX RESULTS TO ( ) - ATTN:

EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315·735·1916 · FAX 315·735·6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS
Log No: 1 *of* 1

CLIENT: Greenville Elementary
PROJECT NAME/LOCATION: 100 Glendale Rd, Scarsdale, NY
SAMPLES COLLECTED BY: Pat Baker
NYS DEPT OF LABOR CERTIFICATE NO. 13-10438
DATE SAMPLED: 2-16-22
PROJECT#: 142104

ANALYSIS: ☐ PLM Only ☐ TEM Only ☐ PLM/TEM as required by ELAP ☐ Other _____

TURNAROUND TIME: ☐ RUSH ☐ 12 Hour ☒ 24 HOUR ☐ 48 Hour ☐ 72 Hour ☐ Other _____

NOTES: Stop at 1st Positive

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
007-A		Elbows - white		Sample A only
007-B		" "		
008-A		Ceiling tile		Sample A only
008-B		" "		—
009-A		Sheetrock / Brown		Sample all Colors
009-B		white / Brown / Blue		
010-A		Plaster / Tan		Sample 010 A only
010-B				
010-C				
010-D				
010-E				

22202259

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Pat Baker	Patrick A Baker	E+R	2-17-22	11
Received by:	T Liang	T Liang	AmeriSciNY	2/21/22 10:25	

PLEASE EMAIL RESULTS TO E+R and nbairtesting@gmail.com @ ATTN:

PLEASE FAX RESULTS TO ( ) - ATTN:

APPENDIX D

ACCREDITATIONS

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Eisenbach and Ruhnke Engineering, P.C.

291 Genesee Street

Utica, NY 13501

FILE NUMBER: 99-0709
LICENSE NUMBER: 29318
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 11/22/2021
EXPIRATION DATE: 11/30/2022

Duly Authorized Representative – Jack Eisenbach:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Amy Phillips, Director
For the Commissioner of Labor

SH 432 (8/12)

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2022
Issued April 01, 2021

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

MR. PAUL J. MUCHA
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 63000

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S

MATTHEW C INMAN
CLASS(EXPIRES)
C ATEC(11/22) D INSP(11/22)
H PM (11/22)

CERT# 97-21978
DMV# 893350254

MUST BE CARRIED ON ASBESTOS PROJECTS

01213 0062097791 02

EYES BRO
HAIR BRO
HGT 6' 00"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

STATE OF NEW YORK - DEPARTMENT OF LABOR

ASBESTOS CERTIFICATE

N.Y.S

PATRICK A BAKER

CLASS(EXPIRES)

C ATEC(11/22) D INSP(11/22)

H PM (11/22)

CERT# 13-10438

DMV# 523761474

MUST BE CARRIED ON ASBESTOS PROJECTS

11/03/2021

Project:
Edgemont School District-
Greenville Elementary
School Equipment Cut
Data

From:

Raymond/ Raymond Associates
Brett Farrell
44 St. John Street
Goshen, NY 10924
(845) 360-5112

To:

Table of Contents

11/03/2021

DESIGNS

Project:
Edgemont School District-
Seely Elementary School
Equipment Cut Data

From:
Raymond/ Raymond Associates
Brett Farrell
44 St. John Street
Goshen, NY 10924
(845) 360-5112

To:

Table of Contents

EAGLE GROUP®
Profit from the Eagle Advantage®

Specification Sheet

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Hand Sinks* with Towel and/or Soap Dispenser

MODELS:
- ❑ ***HSA-10-FDP***
- ❑ ***HSA-10-FDPS***
- ❑ ***HSA-10-FLDP***
- ❑ ***HSA-10-FODP***
- ❑ ***HSA-10-FWLDP-LRS***

Short Form Specifications

Eagle Hand Sink, model HSA-10-FDP. Constructed of type 304 stainless steel, all-welded with deep-drawn positive drain sink bowl, inverted "V" edge to prevent spillage, drain, paper towel dispenser, soap dispenser and splash mounted gooseneck faucet.

Eagle Hand Sink, model HSA-10-FDPS. Features are the same as #HSA-10-FDP, plus stainless steel sink skirt.

Eagle Hand Sink, model HSA-10-FLDP. Features are the same as #HSA-10-FDP, plus polymer lever drain.

Eagle Hand Sink, model HSA-10-FODP. Features are the same as #HSA-10-FDP, plus polymer lever drain with overflow.

Eagle Hand Sink, model HSA-10-FWLDP-LRS. Features splash mount gooseneck faucet with wrist handles, towel displenser, soap dispenser, polymer lever drain, and end splashes.

#HSA-10-FDP

Design & Construction Features

- Heavy gauge type 304 stainless steel all-welded construction.
- Inverted "V" edge rim retards spillage.
- Backsplash with a 2˝ (51mm) return on a 45° angle.
- ½˝ (13mm) NPS water inlet, 1½˝ (38mm) NPS drain outlet.
- Unique deep-drawn positive-drain bowl assures complete drainage to meet the most stringent health code requirements.
- All-welded towel dispenser features hinged top assembly, sight window to visually inspect towel level, quick-fill soap dispenser, and is designed to accommodate 4˝ x 10˝ (102 x 254mm) C-fold disposable paper towels.
- Comes with mounting bracket to facilitate wall mount installation.

Options / Accessories

- ❑ P-trap
- ❑ Tail piece
- ❑ End splashes
- ❑ Front skirt**
- ❑ Side mount wall bracket
- ❑ MICROGARD® antimicrobial agent***

** Front skirt available only for models HSA-10-FDP and HSA-10-FDPS.
*** For hand sinks #HSA-10-FDP and #HSA-10-FDPS only.

* Non-electric. For hand sinks with electric soap dispenser and faucets, see spec sheet #20.42.
For hand sinks with deck-mounted soap dispensers, see spec sheets #EG20.05 and #EG20.07.

EAGLE GROUP
100 Industrial Boulevard, Clayton, DE 19938-8903 USA
Phone: 302-653-3000 • Fax: 302-653-2065
www.eaglegrp.com

Foodservice Division: Phone 800-441-8440
MHC/Retail Display Divisions: Phone 800-637-5100

Certifications / Approvals

NSF

AUTOQUOTES

KCL

For custom configuration or fabrication needs, contact our **SpecFAB® Division.**
Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

EG20.41 Rev. 09/14

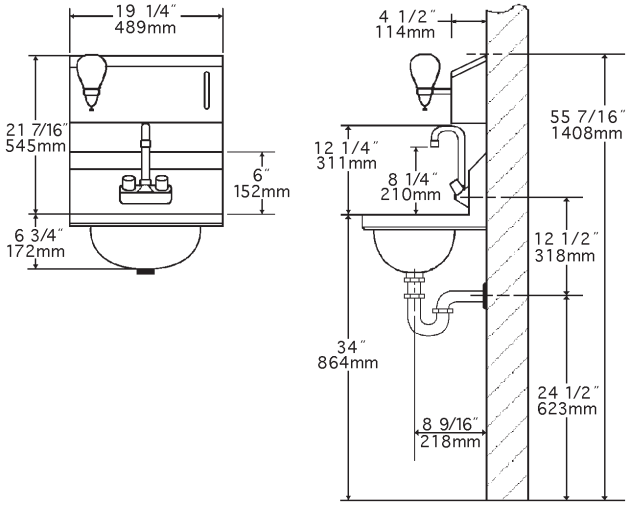
Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

EAGLE GROUP®
Profit from the Eagle Advantage®

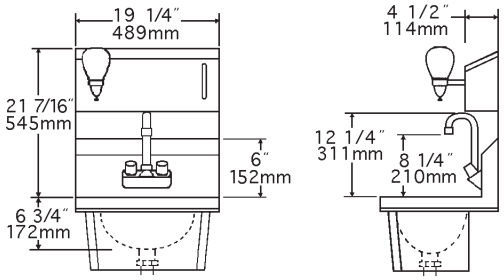
Item No.: _____
Project No.: _____
S.I.S. No.: _____

Hand Sinks with Towel and/or Soap Dispensers

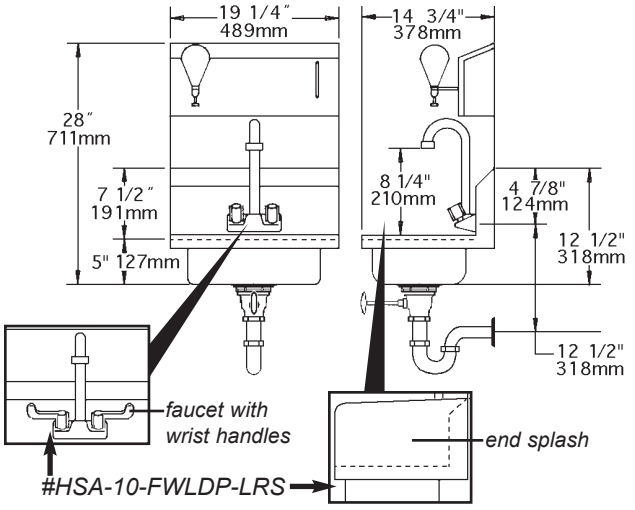
HSA-10-FDP



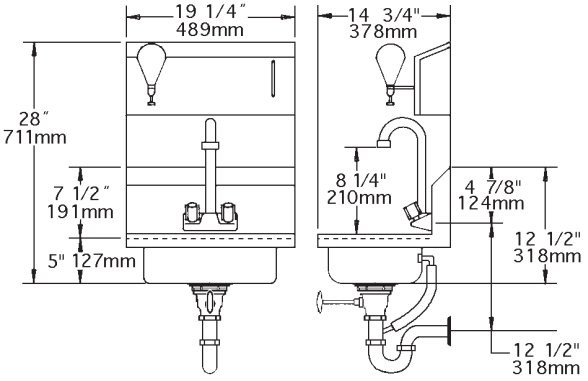
HSA-10-FDPS



HSA-10-FLDP / HSA-10-FWLDP-LRS



HSA-10-FODP



model #	includes towel dispenser, soap dispenser, and…	bowl size width x length x depth in.	bowl size mm	overall size width x length x height in.	overall size mm	weight lbs.	weight kg
HSA-10-FDP	faucet, basket drain	9¾″ x 13½″ x 6¾″	248 x 343 x 173	14¾″ x 19¼″ x 28¼″	376 x 489 x 718	29	13.2
HSA-10-FDPS	faucet, skirt, basket drain	9¾″ x 13½″ x 6¾″	248 x 343 x 173	14¾″ x 19¼″ x 30″	376 x 489 x 762	29	13.2
HSA-10-FLDP	faucet, polymer lever drain	10″ x 14″ x 5″	254 x 256 x 127	14¾″ x 19¼″ x 28″	376 x 489 x 711	32	14.5
HSA-10-FODP	faucet, polymer lever drain w/overflow	10″ x 14″ x 5″	254 x 256 x 127	14¾″ x 19¼″ x 28″	376 x 489 x 711	30	13.6
HSA-10-FWLDP-LRS	faucet w/wrist handles, poly lever drain, end splashes	10″ x 14″ x 5″	254 x 256 x 127	14¾″ x 19¼″ x 28″	376 x 489 x 711	30	13.6

EAGLE GROUP
100 Industrial Boulevard, Clayton, DE 19938-8903 USA
Phone: 302-653-3000 • Fax: 302-653-2065
www.eaglegrp.com

Foodservice Division: Phone 800-441-8440
MHC/Retail Display Divisions: Phone 800-637-5100

Rev. 09/14

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

EAGLE GROUP®

Profit from the Eagle Advantage®

Item No.: _____

Project No.: _____

S.I.S. No.: _____

Specification Sheet

Short Form Specifications

Eagle Spec-Master® Three-Compartment Sinks, model _____. Unit constructed of 14 gauge 300 series, 18-8 stainless steel throughout. Sink bowls coved with a full ⅝″ radius, and shall have a 14″ water level. Drainboards, when required, shall be "V" creased for positive drainage. 9½″ high backsplash with 1″ upturn and tile edge. Legs to be 1⅝″ O.D., stainless steel, with stainless steel gussets, stainless steel crossbracing and adjustable stainless steel bullet feet.

3-compartment sink
(faucets not included)

Options / Accessories

- ❑ Lever drain
- ❑ Lever drain with overflow
- ❑ Twist handle drains
- ❑ Overflow hole
- ❑ Sink kits
- ❑ Faucets
- ❑ Polyboard sink covers
- ❑ Stainless steel sink covers
- ❑ Skirted front panel

Assembly:

- Entire assembly is fuse-welded and planished, providing a one-piece seamless sink unit.
- Welded areas are high-speed belt blended to match adjacent surfaces with continuity of satin finish.
- All outside corners of assembly are bullnosed to provide safe, clean edges.
- Water supply is ½″ (13mm) NPS for hot and cold lines.

Spec-Master® FN Series Coved Corner Three-Compartment Sinks

MODELS:

❑ ***FN2048-3-**** ❑ ***FN2472-3-****
❑ ***FN2054-3-**** ❑ ***FN2860-3-****
❑ ***FN2060-3-****

** See table on back for complete model numbers.*

Top:

- Drainboards, backsplash and rolled rims are 14 gauge 300 series stainless steel.
- Drainboards, when provided, are integrally welded.
- All rolled edges are highlighted for enhanced appearance.
- 9½″ high backsplash with 1″ upturn and tile edge.
- 1⅛″ (29mm) faucet holes* punched on 8″ (203mm) centers.

Base:

- Legs: 1⅝″ (41mm)-diameter stainless steel tubing with stainless steel gussets and fully adjustable stainless steel bullet feet.
- Crossbracing: Adjustable, 1¼″ (32mm)-diameter stainless steel; running left-to-right and front-to-back.
- Leg locations fall directly under sink bowls**, providing increased stability and maximum weight support.
- Leg gussets welded to a die-cut heavy-gauge stainless steel reinforcing corner plate.
- Legs are crossbraced on all sides for increased stability.

Sink Bowls:

- 14 gauge 300 series stainless steel.
- 14″ (356mm) water level, 17″ (432mm) flood level.
- Sink compartments are coved on a full ⅝″ (41mm) radius and constructed using state-of-the-art seamless welding techniques.
- Basket-type waste drain fits sink bowls' 3½″ (89mm) opening and features 1½″ (38mm) outlet.

* Three-compartment sinks with 20″ x 16″ (508 x 406mm) bowls have one set of faucet holes. All others feature two sets of faucet holes.

** On sinks with drainboard(s) 30″ or longer, legs are located underneath the outer end of drainboard(s).

Certifications / Approvals

NSF

AutoQuotes

KCL

EAGLE GROUP
100 Industrial Boulevard, Clayton, DE 19938-8903 USA
Phone: 302-653-3000 • Fax: 302-653-2065
www.eaglegrp.com

Foodservice Division: Phone 800-441-8440
MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our **SpecFAB® Division.**
Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

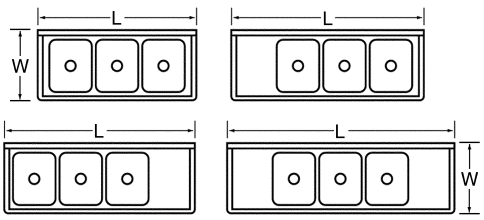
EG20.34 Rev. 02/18

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

EAGLE GROUP®
Profit from the Eagle Advantage®

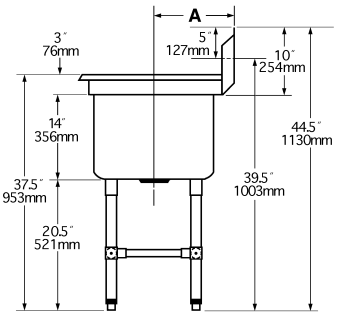
Item No.: _____
Project No.: _____
S.I.S. No.: _____

Spec-Master® FN Series Coved Corner Three-Compartment Sinks



Drain location for rough-in

bowl width in.	bowl width mm	bowl length in.	bowl length mm	Dimension A	
20″	508	16″	406	14″	356
20″	508	18″	457	14″	356
20″	508	20″	508	14″	356
24″	610	24″	610	16″	406
28″	711	20″	508	18″	457



model #	BOWL DIMENSIONS width in.	width mm	length in.	length mm	DRAINBOARD quantity	length in.	length mm	OVERALL DIMENSIONS width in.	width mm	length in.	length mm	weight lbs.	weight kg
FN2048-3-14/3	20″	508	16″	406	0	-		27″	686	57″	1448	99	44.9
FN2048-3-18R or ***L-14/3***	20″	508	16″	406	1	18″	457	27″	686	73½″	1867	118	53.5
FN2048-3-18-14/3	20″	508	16″	406	2	18″	457	27″	686	90″	2286	137	61.7
FN2048-3-24R or ***L-14/3***	20″	508	16″	406	1	24″	610	27″	686	79½″	2019	124	56.2
FN2048-3-24-14/3	20″	508	16″	406	2	24″	610	27″	686	102″	2591	149	67.6
FN2048-3-30R or ***L-14/3***	20″	508	16″	406	1	30″	762	27″	686	85½″	2172	129	58.5
FN2048-3-30-14/3	20″	508	16″	406	2	30″	762	27″	686	114″	2896	159	72.1
FN2048-3-36R or ***L-14/3***	20″	508	16″	406	1	36″	914	27″	686	91½″	2324	134	60.8
FN2048-3-36-14/3	20″	508	16″	406	2	36″	914	27″	686	126″	3200	169	76.7
FN2054-3-14/3 *	20″	508	18″	457	0	-		27″	686	63″	1600	102	46.3
FN2054-3-18R or ***L-14/3 ****	20″	508	18″	457	1	18″	457	27″	686	79½″	2019	121	54.9
FN2054-3-18-14/3 *	20″	508	18″	457	2	18″	457	27″	686	96″	2438	140	63.5
FN2054-3-24R or ***L-14/3 ****	20″	508	18″	457	1	24″	610	27″	686	85½″	2172	127	57.6
FN2054-3-24-14/3 *	20″	508	18″	457	2	24″	610	27″	686	108″	2743	158	71.6
FN2054-3-30R or ***L-14/3 ****	20″	508	18″	457	1	30″	762	27″	686	91½″	2324	132	59.9
FN2054-3-30-14/3 *	20″	508	18″	457	2	30″	762	27″	686	120″	3048	162	73.5
FN2054-3-36R or ***L-14/3 ****	20″	508	18″	457	1	36″	914	27″	686	97½″	2477	137	62.1
FN2054-3-36-14/3 *	20″	508	18″	457	2	36″	914	27″	686	132″	3358	172	78.0
FN2060-3-14/3 *	20″	508	20″	508	0	-		27″	686	69″	1753	114	51.7
FN2060-3-18R or ***L-14/3 ****	20″	508	20″	508	1	18″	610	27″	686	85½″	2172	133	60.3
FN2060-3-18-14/3 *	20″	508	20″	508	2	18″	457	27″	686	102″	2591	152	68.9
FN2060-3-24R or ***L-14/3 ****	20″	508	20″	508	1	24″	457	27″	686	91½″	2324	139	63.1
FN2060-3-24-14/3 *	20″	508	20″	508	2	24″	610	27″	686	114″	2896	164	74.4
FN2060-3-30R or ***L-14/3 ****	20″	508	20″	508	1	30″	762	27″	686	97½″	2477	144	65.3
FN2060-3-30-14/3 *	20″	508	20″	508	2	30″	762	27″	686	126″	3200	174	78.9
FN2060-3-36R or ***L-14/3 ****	20″	508	20″	508	1	36″	914	27″	686	103½″	2629	149	67.6
FN2060-3-36-14/3 *	20″	508	20″	508	2	36″	914	27″	686	138″	3505	184	83.5
FN2472-3-14/3 *	24″	610	24″	610	0	-		31″	787	81″	2057	127	57.6
FN2472-3-18R or ***L-14/3 ****	24″	610	24″	610	1	18″	457	31″	787	97½″	2477	146	66.2
FN2472-3-18-14/3 *	24″	610	24″	610	2	18″	457	31″	787	114″	2896	165	74.8
FN2472-3-24R or ***L-14/3 ****	24″	610	24″	610	1	24″	610	31″	787	103½″	2629	152	68.9
FN2472-3-24-14/3 *	24″	610	24″	610	2	24″	610	31″	787	126″	3200	177	80.3
FN2472-3-30R or ***L-14/3 ****	24″	610	24″	610	1	30″	762	31″	787	109½″	2769	157	71.2
FN2472-3-30-14/3 *	24″	610	24″	610	2	30″	762	31″	787	138″	3505	187	84.8
FN2472-3-36R or ***L-14/3 ****	24″	610	24″	610	1	36″	914	31″	787	115½″	2934	162	73.5
FN2472-3-36-14/3 *	24″	610	24″	610	2	36″	914	31″	787	150″	3810	197	89.4
FN2860-3-14/3 *	28″	711	20″	508	0	-		35″	889	69″	1753	130	59.0
FN2860-3-18R or ***L-14/3 ****	28″	711	20″	508	1	18″	457	35″	889	85½″	2172	149	67.6
FN2860-3-18-14/3 *	28″	711	20″	508	2	18″	457	35″	889	102″	2591	168	76.2
FN2860-3-24R or ***L-14/3 ****	28″	711	20″	508	1	24″	610	35″	889	91½″	2324	155	70.3
FN2860-3-24-14/3 *	28″	711	20″	508	2	24″	610	35″	889	114″	2896	180	81.6
FN2860-3-30R or ***L-14/3 ****	28″	711	20″	508	1	30″	762	35″	889	97½″	2477	160	72.6
FN2860-3-30-14/3 *	28″	711	20″	508	2	30″	762	35″	889	126″	3200	190	86.2
FN2860-3-36R or ***L-14/3 ****	28″	711	20″	508	1	36″	914	35″	889	103½″	2629	165	74.8
FN2860-3-36-14/3 *	28″	711	20″	508	2	36″	914	35″	889	138″	3505	200	90.7

* Features two sets of faucet holes.

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EAGLE GROUP®
Profit from the Eagle Advantage®

Specification Sheet

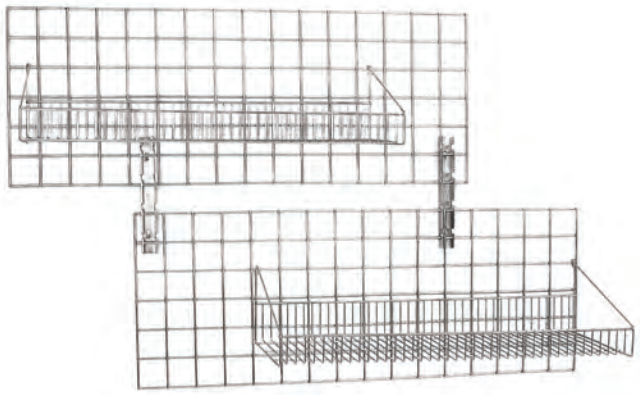
Item No.: _____
Project No.: _____
S.I.S. No.: _____

Wall Grid Shelving for Walstor® Modular Wall System

MODELS:

❑ *1430WGS-C*	❑ *1430WGS-VG*	❑ *1430WGS-Z*
❑ *1436WGS-C*	❑ *1436WGS-VG*	❑ *1436WGS-Z*
❑ *1830WGS-C*	❑ *1830WGS-VG*	❑ *1830WGS-Z*
❑ *1836WGS-C*	❑ *1836WGS-VG*	❑ *1836WGS-Z*
❑ *1848WGS-C*	❑ *1848WGS-VG*	❑ *1848WGS-Z*

See spec sheet #**EG02.00A** for Wall Modular Wall System.
See spec sheet #**EG02.00B** for Walstor® accessories.



wall grid shelves shown attached to Walstor® wall mats

Design and Construction Features

- Provides convenient wire shelving that hooks anywhere onto wall mat of Walstor® Wall System, without fasteners.
- Features built-in 2¾″ (70mm)-high front ledge and 3⅞″ (98mm)-high rear upturn.
- Shelf and brackets welded into one piece.
- Comes in widths of 14″ or 18″ (356 or 457mm), and lengths of 30″, 36″, or 48″ (762, 914, or 1219mm).
- Offered with chrome, Valu-Gard® green epoxy, or EAGLEbrite® zinc finish.

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For custom configuration or fabrication needs, contact our **SpecFAB® Division.**
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AUTOQUOTES
KCL

EG02.00C Rev. 05/10

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EAGLE GROUP
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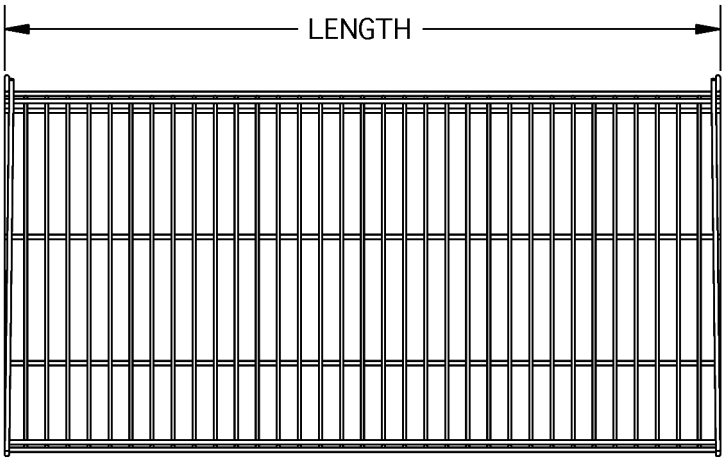
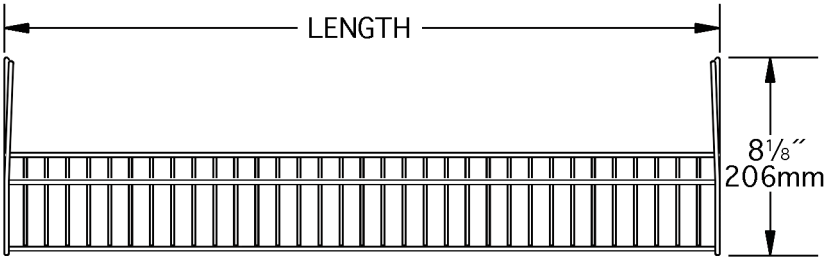
Item No.: _____
Project No.: _____
S.I.S. No.: _____

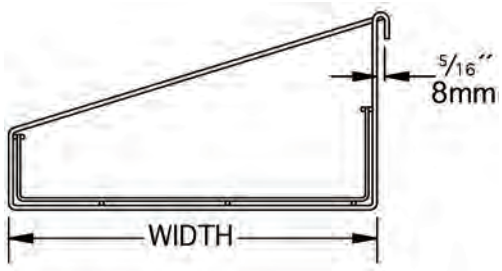
Wall Grid Shelving for Walstor® Modular Wall System



TOP VIEW



FRONT VIEW



SIDE VIEW

CHROME model #	VALU-GARD® model #	EAGLEBRITE® model #	width in.	width mm	length in.	length mm	weight lbs.	weight kg
1430WGS-C	*1430WGS-VG*	*1430WGS-Z*	14″	356	30″	762	7	3.2
1436WGS-C	*1436WGS-VG*	*1436WGS-Z*	14″	356	36″	914	9	4.1
1830WGS-C	*1830WGS-VG*	*1830WGS-Z*	18″	457	30″	762	9	4.1
1836WGS-C	*1836WGS-VG*	*1836WGS-Z*	18″	457	36″	914	12	5.4
1848WGS-C	*1848WGS-VG*	*1848WGS-Z*	18″	457	48″	1219	15	6.8

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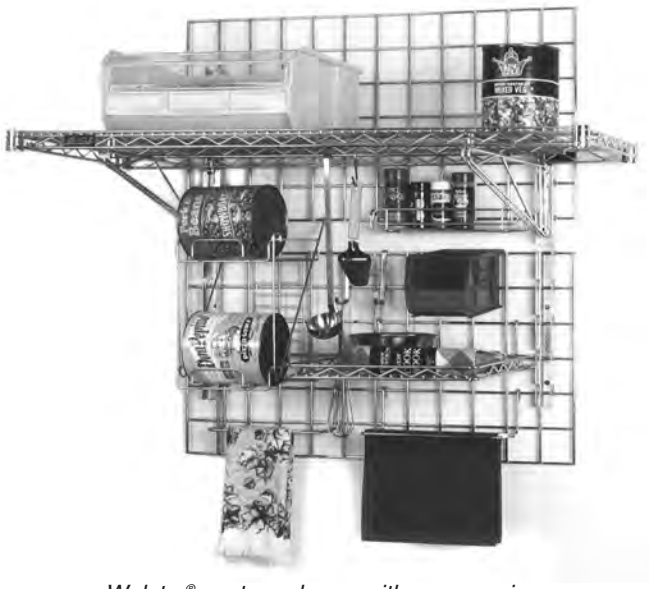
S.I.S. No.: _____

Specification Sheet



Walstor® system shown with accessories

Walstor® Modular Wall System Accessories

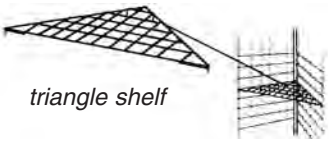
MODELS:

❑ *PH3RD*	❑ *MDH-4*	❑ *SR24*
❑ *BH-1*	❑ *MDH-6*	❑ *TR10*
❑ *DSS*	❑ *MDH-8*	❑ *UH*
❑ *DB*	❑ *MDH-10*	❑ *WB*
❑ *GS17*	❑ *MDH-12*	❑ *CR2D*
❑ *HFH*	❑ *A204237*	❑ *CR4D*
❑ *LDH*	❑ *PBH*	❑ *GPWB*
❑ *A203879*	❑ *A203877*	❑ *GPS24-C*
❑ *LH*	❑ *SH*	❑ *GBP15-C*
❑ *LDUS12*	❑ *SR14*	

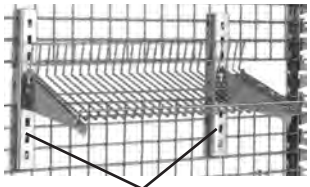
See #**EG02.00A** for Walstor® Modular Wall Systems.
See #**EG02.00C** for Optional Wall Grid Shelving for Walstor®.

grid shelf

light duty utility shelf



triangle shelf



vertical uprights for display shelf

SHELVES model #	description	weight lbs.	weight kg	length x width x height in.	length x width x height mm
GS17	grid shelf	4.0	1.8	16¾″ x 16¾″	426 x 426
LDUS12	light duty utility shelf	2.0	0.9	11¼″ x 8″ x 3½″	286 x 203 x 89
GPS24-C	triangle shelf	3.6	1.6	24″ x 24″	610 x 610
MISCELLANEOUS					
DSS	vertical uprights	2.0	0.9	2″ x 8¾″	305 x 222
GPWB	wall bracket	0.2	0.1	3″ x 4″ x 4″	76 x 102 x 102

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Certifications / Approvals

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AUTOQUOTES

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Item No.: _____
Project No.: _____
S.I.S. No.: _____

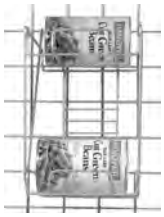
Walstor® Modular Wall System Accessories


large double hook


large snap hook


merchandising display hook


rack


can rack (2-deck)


one-third size pan holder


book holder


hanging file holder


large bin


drop basket

HOOKS AND BRACKETS *		weight		length x width x height	
model #	description	lbs.	kg	in.	mm
LDH	large double hook	0.3	0.1	2¼″ x 4¼″ x ⅜″	57 x 108 x 3
LH	large snap hook	0.3	0.1	2¼″ x 4¼″ x ⅜″	57 x 108 x 3
MDH-4	merchandise display hook	0.2	0.1	4″ x 3″	102 x 76
MDH-6	merchandise display hook	0.2	0.1	6″ x 3″	152 x 76
MDH-8	merchandise display hook	0.2	0.1	8″ x 3″	203 x 76
MDH-10	merchandise display hook	0.2	0.1	10″ x 3″	254 x 76
MDH-12	merchandise display hook	0.2	0.1	12″ x 3″	305 x 76
SH	small snap hook	0.3	0.1	1¼″ x 4¼″ x ⅜″	32 x 108 x 3
UH	utensil hook	0.3	0.1	2½″ x 2″	64 x 51
RACKS					
SR14	rack	1.0	0.5	14″ x 2″	356 x 51
SR24	rack	1.5	0.7	24″ x 2″	610 x 51
TR10	towel rack	1.0	0.5	10½″ x 5″ x 3½″	267 x 127 x 89
CR2D	2-deck can rack	1.0	0.5	8⅝″ x 13″ x 14″	219 x 330 x 356
CR4D	4-deck can rack	3.0	1.3	8¼″ x 8½″ x 28½″	210 x 216 x 724
HOLDERS					
PH3RD	one-third size pan holder	1.0	0.5	12″ x 8″ x 3″	305 x 203 x 76
BH-1	book holder	2.0	0.9	3″ x 12″ x 10″	76 x 305 x 254
HFH	hanging file holder	1.0	0.5	12″ x 8″ x 3″	305 x 203 x 76
PBH	plastic bin holder	0.3	0.1	4″ x 2″	102 x 51
BINS AND BIN ACCESSORIES					
A203877 **	small plastic bin	1.0	0.5	10⅞″ x 5½″ x 5″	276 x 140 x 89
A203879 **	large plastic bin	1.0	0.5	10⅞″ x 11″ x 5″	276 x 280 x 89
A204237	plastic bin dividers	2.0	0.9	10⅞″ x 5″	276 x 89
BASKETS					
DB	drop basket (for 18″ wire shelf)	3.0	1.4	22″ x 18″ x 11″	559 x 457 x 280
WB	wire basket	0.5	0.2	13⅜″ x 5″ x 7″	340 x 127 x 178
GBP15-C	grid panel basket	2.8	1.2	15″ x 24″	381 x 610

* All hooks are heavy gauge chrome-plated mild steel.
** #A203877 and #A203879 bins require #PBH plastic bin holder.

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We put space to work.

Item # _____

Job _____

MetroMax® Q Polymer/Wire Shelving Starter and Add-on Units.

Quick-to-adjust, corrosion resistant shelving constructed of removable polymer open grid shelf mats, wire shelf frames, and corner releases. Shelf frames have an epoxy coating over an electroplated substrate and lift-off plastic shelf mats. Shelves offer a 20 year warranty against corrosion. Rust proof polymer posts offer a lifetime warranty against corrosion. Shelf mats and posts have built-in Microban® antimicrobial product protection. Rigid four-sided shelf frame and welded corners provide complete 360° capture of the wedge and post to ensure stability, strength and structural integrity. Each Starter and Add-on unit has a maximum capacity of 2,000 lbs. (907kg) evenly distributed. Units assemble easily — Shelves mount on four one-piece wedges along grooved, numbered posts. Shelves adjust on 1" (25mm) increments.

Four Shelf Starter Unit

- **Starter units:** shelves and polymer posts under one easy to order model number.
- **Add-on units:** include (2) polymer posts, open grid mat shelves, and S-hooks to connect a unit end-to-end under one easy to order model number.
- **Corner (Right Angle) units:** allow easy access to the shelf contents by eliminating a front post. They are configured using a starter unit, an add-on unit and intermediate "S" hook brackets.
- **Forever Strong:** Proven corner connection and four-sided shelf frame with center truss(es) assures stability and strength in stationary, mobile, and high-density track shelving configurations. 800 lbs. (363kg) per shelf for lengths of 24" to 48" (610 to 1219mm) 600 lbs. (272kg) per shelf for lengths of 54" (1372mm) or longer Stationary unit: 2000lbs (907kg) evenly distributed.
- **Life-Long Rust Resistant:** Shelves offer a 20 year warranty against rust and corrosion. Polymer posts are rust-proof.
- **Easy to Clean and Maintain:** Polymer mats can be easily removed and cleaned in a sink or commercial washer / dish machine.
- **Microban® Antimicrobial Product Protection:** is built into the shelf mats and posts to inhibit the growth of bacteria, mold, mildew, and fungus that cause odors and product degradation. Microban product protection keeps the product "cleaner between cleanings".
- **Quick-to-Adjust:** Patented corner release allows shelves to be adjusted without tools. Simply flip each corner release, relocate the wedge connectors on the posts, and reposition the shelf. Quickly adjust shelves to reclaim wasted vertical space.
- **Efficient Use of Space:** Shelves adjust on 1" (25mm) increments along the post to maximize the use of available vertical space.
- **Fast, Easy Assembly:** Shelves are ready to use right out of the box. One-piece wedges securely attach to the posts – Raised beads on the back of each wedge snap into the grooves on the post. Window on wedge aligns with numbers on the post to locate the desired shelf position. Shelf seats into position over the posts and wedges. A unit can be assembled without tools in minutes.
- **Open Grid (vented) Shelf mats:** Sectioned and promote air circulation and light penetration. Built-in ship's edge helps contain supplies.
- **NSF Listed for all environments.**
- **Maximum Versatility:** Complete line of accessories are found on spec sheet 9.25.

Starter Unit ***Add-on Unit***

Supports good HACCP processes

MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban® Products Company, Huntersville, NC. Microban® product protection does not by itself protect a user from food borne illness. Product must be routinely cleaned.

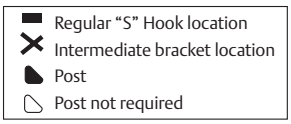
L02-202 Printed in U.S.A. 3/20

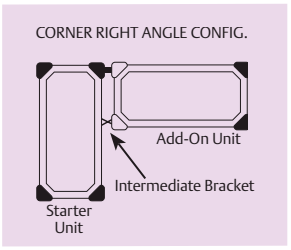
InterMetro Industries Corporation
North Washington Street, Wilkes-Barre, PA 18705
Product Information. U.S. and Canada: 1.800.992.1776
Outside U.S. and Canada: www.metro.com/contactus

MetroMax® Q Starter & Add-on Units

Material Specifications:

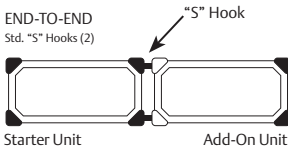
- Shelf Mats: Injection-molded polypropylene with exclusive built-in Microban® antimicrobial product protection.
- Shelf frames and epoxy-coated posts: Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. The adjustable foot is reinforced nylon.
- Polymer Post: Pultrusions — continuous glass fibers and thermoset resin composite with built-in Microban® antimicrobial product protection.
- Shelf Wedge Connector: Reinforced nylon.
- Temperature range: -20°F (-29°C) to 125°F (52°C) continuous use, with intermittent exposure to 200°F (93°C) for cleaning.
- Visit metro.com/service-support for cleaning guidelines.





Starter Units: consist of four or five open grid shelves and four posts.

Add-on Units: consist of four or five shelves, (2) posts, and standard S-Hook Kits (2 per shelf) to configure end-to-end units.
Four tier units include (8) standard "S" Hooks. (model number, M9995)
Five tier units include (10) standard "S" Hooks. (model number, M9995)



Corner (Right Angle) Configurations: select one add-on unit and intermediate "S" Hook brackets.

5-Shelf Unit with 74" polymer posts

Starter Units

Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Starter Unit
18x24	457x610	39.8	18.1	5Q317G3
18x30	457x760	48.8	22.1	5Q327G3
18x36	457x914	57.3	26.0	5Q337G3
18x42	457x1060	65.8	29.8	5Q347G3
18x48	457x1219	74.8	33.9	5Q357G3
18x54	457x1372			
18x60	457x1524	92.3	41.9	5Q367G3
18x72	457x1829	108.8	49.4	5Q377G3
21x24	530x610	48.8	22.1	5Q417G3
21x30	530x760	57.3	26.0	5Q427G3
21x36	530x914	65.8	29.8	5Q437G3
21x42	530x1060	72.8	33.0	5Q447G3
21x48	530x1219	81.3	36.9	5Q457G3
21x54	530x1372			
21x60	530x1524	101.3	45.9	5Q467G3
21x72	530x1829	117.3	53.2	5Q477G3
24x24	610x610	57.3	26.0	5Q517G3
24x30	610x760	65.8	29.8	5Q527G3
24x36	610x914	74.3	33.7	5Q537G3
24x42	610x1060	79.3	36.0	5Q547G3
24x48	610x1219	87.8	39.8	5Q557G3
24x54	610x1372			
24x60	610x1524	110.3	50.0	5Q567G3
24x72	610x1829	126.3	57.3	5Q577G3

Add-On Units

Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Add-On Unit
18x24	457x610	37.4	17.0	5AQ317G3
18x30	457x760	46.4	21.0	5AQ327G3
18x36	457x914	54.9	24.9	5AQ337G3
18x42	457x1060	63.4	28.8	5AQ347G3
18x48	457x1219	72.4	32.8	5AQ357G3
18x54	457x1372			
18x60	457x1524	89.9	40.8	5AQ367G3
18x72	457x1829	106.4	48.3	5AQ377G3
21x24	530x610	46.4	21.0	5AQ417G3
21x30	530x760	54.9	24.9	5AQ427G3
21x36	530x914	63.4	28.8	5AQ437G3
21x42	530x1060	70.4	31.9	5AQ447G3
21x48	530x1219	78.9	35.8	5AQ457G3
21x54	530x1372			
21x60	530x1524	98.9	44.9	5AQ467G3
21x72	530x1829	114.9	52.1	5AQ477G3
24x24	610x610	54.9	24.9	5AQ517G3
24x30	610x760	63.4	28.8	5AQ527G3
24x36	610x914	71.9	32.6	5AQ537G3
24x42	610x1060	76.9	34.9	5AQ547G3
24x48	610x1219	85.4	38.7	5AQ557G3
24x54	610x1372			
24x60	610x1524	107.9	48.9	5AQ567G3
24x72	610x1829	123.9	56.2	5AQ577G3

Actual Dimensions:
Width: Add 3/8" (10mm) to nominal size. Length: Subtract 3/16" (5mm) from nominal size.

74" Five Shelf Starter Unit

Starter & Add-on Unit Together

"S" Hook
Cat. No. **M9995**

Intermediate"S" Hook Kit
Cat. No. **Q9995Z**

Creating a Right Angle (Corner) configuration. Use one standard "S" Hook (included with the Add-on unit) and one Intermediate "S" Hook per tier. Intermediate"S" Hook Bracket Cat. No. Q9995Z

Job _____

MetroMax® Q Starter & Add-on Units

We put space to work.

4-Shelf Unit with 74" polymer posts

Starter Units

Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Starter Unit
18x24	457x610	33.6	15.2	MQ-182474G-S-4
18x30	457x760	40.8	18.5	MQ-183074G-S-4
18x36	457x914	47.6	21.6	MQ-183674G-S-4
18x42	457x1060	54.4	24.7	MQ-184274G-S-4
18x48	457x1219	61.6	27.9	MQ-184874G-S-4
18x54	457x1372	68.8	31.2	MQ-185474G-S-4
18x60	457x1524	75.6	34.3	MQ-186074G-S-4
18x72	457x1829	88.8	40.3	MQ-187274G-S-4
21x24	530x610	40.8	18.5	MQ-212474G-S-4
21x30	530x760	47.6	21.6	MQ-213074G-S-4
21x36	530x914	54.4	24.7	MQ-213674G-S-4
21x42	530x1060	60.0	27.2	MQ-214274G-S-4
21x48	530x1219	66.8	30.3	MQ-214874G-S-4
21x54	530x1372	75.6	34.3	MQ-215474G-S-4
21x60	530x1524	82.8	37.6	MQ-216074G-S-4
21x72	530x1829	95.6	43.4	MQ-217274G-S-4
24x24	610x610	47.6	21.6	MQ-242474G-S-4
24x30	610x760	54.4	24.7	MQ-243074G-S-4
24x36	610x914	61.2	27.8	MQ-243674G-S-4
24x42	610x1060	65.2	29.6	MQ-244274G-S-4
24x48	610x1219	72.0	32.7	MQ-244874G-S-4
24x54	610x1372	82.8	37.6	MQ-245474G-S-4
24x60	610x1524	90.0	40.8	MQ-246074G-S-4
24x72	610x1829	102.8	46.6	MQ-247274G-S-4

Add-On Units

Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Add-On Unit
18x24	457x610	30.8	14.0	MQ-182474G-A-4
18x30	457x760	38.0	17.2	MQ-183074G-A-4
18x36	457x914	44.8	20.3	MQ-183674G-A-4
18x42	457x1060	51.6	23.4	MQ-184274G-A-4
18x48	457x1219	58.8	26.7	MQ-184874G-A-4
18x54	457x1372	66.0	29.9	MQ-185474G-A-4
18x60	457x1524	72.8	33.0	MQ-186074G-A-4
18x72	457x1829	86.0	39.0	MQ-187274G-A-4
21x24	530x610	38.0	17.2	MQ-212474G-A-4
21x30	530x760	44.8	20.3	MQ-213074G-A-4
21x36	530x914	51.6	23.4	MQ-213674G-A-4
21x42	530x1060	57.2	25.9	MQ-214274G-A-4
21x48	530x1219	64.0	29.0	MQ-214874G-A-4
21x54	530x1372	72.8	33.0	MQ-215474G-A-4
21x60	530x1524	80.0	36.3	MQ-216074G-A-4
21x72	530x1829	92.8	42.1	MQ-217274G-A-4
24x24	610x610	44.8	20.3	MQ-242474G-A-4
24x30	610x760	51.6	23.4	MQ-243074G-A-4
24x36	610x914	58.4	26.5	MQ-243674G-A-4
24x42	610x1060	62.4	28.3	MQ-244274G-A-4
24x48	610x1219	69.2	31.4	MQ-244874G-A-4
24x54	610x1372	80.0	36.3	MQ-245474G-A-4
24x60	610x1524	87.2	39.6	MQ-246074G-A-4
24x72	610x1829	95.6	43.4	MQ-247274G-A-4

4-Shelf Starter Unit

4-Shelf Unit with 63" polymer posts

Starter Units

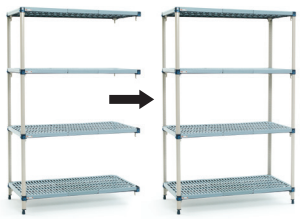
Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Starter Unit
18x24	457x610	32.0	14.5	Q316G3
18x30	457x760	39.2	17.8	Q326G3
18x36	457x914	46.0	20.9	Q336G3
18x42	457x1060	52.8	23.9	Q346G3
18x48	457x1219	60.0	27.2	Q356G3
18x54	457x1372			
18x60	457x1524	74.0	33.6	Q366G3
18x72	457x1829	87.2	39.6	Q376G3
21x24	530x610	39.2	17.8	Q416G3
21x30	530x760	46.0	20.9	Q426G3
21x36	530x914	52.8	23.9	Q436G3
21x42	530x1060	58.4	26.5	Q446G3
21x48	530x1219	65.2	29.6	Q456G3
21x54	530x1372			
21x60	530x1524	81.2	36.8	Q466G3
21x72	530x1829	94.0	42.6	Q476G3
24x24	610x610	46.0	20.9	Q516G3
24x30	610x760	52.8	23.9	Q526G3
24x36	610x914	59.6	27.0	Q536G3
24x42	610x1060	63.6	28.8	Q546G3
24x48	610x1219	70.4	31.9	Q556G3
24x54	610x1372			
24x60	610x1524	88.4	40.1	Q566G3
24x72	610x1829	101.2	45.9	Q576G3

Add-On Units

Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Add-On Unit
18x24	457x610	30.0	13.6	AQ316G3
18x30	457x760	37.2	16.9	AQ326G3
18x36	457x914	44.0	20.0	AQ336G3
18x42	457x1060	50.8	23.0	AQ346G3
18x48	457x1219	58.0	26.3	AQ356G3
18x54	457x1372			
18x60	457x1524	72.0	32.7	AQ366G3
18x72	457x1829	85.2	38.6	AQ376G3
21x24	530x610	37.2	16.9	AQ416G3
21x30	530x760	44.0	20.0	AQ426G3
21x36	530x914	50.8	23.0	AQ436G3
21x42	530x1060	56.4	25.6	AQ446G3
21x48	530x1219	63.2	28.7	AQ456G3
21x54	530x1372			
21x60	530x1524	79.2	35.9	AQ466G3
21x72	530x1829	92.0	41.7	AQ476G3
24x24	610x610	44.0	20.0	AQ516G3
24x30	610x760	50.8	23.0	AQ526G3
24x36	610x914	57.6	26.1	AQ536G3
24x42	610x1060	61.6	27.9	AQ546G3
24x48	610x1219	68.4	31.0	AQ556G3
24x54	610x1372			
24x60	610x1524	86.4	39.2	AQ566G3
24x72	610x1829	99.2	45.0	AQ576G3

4-Shelf Add-On Unit

Includes 8 S-Hooks



Add-on mounts to starter unit via S-Hooks.

Actual Dimensions:
Width: Add 3/8" (10mm) to nominal size. Length: Subtract 3/16" (5mm) from nominal size.

CRES COR®

JOB: _____

ITEM NO: _____

INSULATED STAINLESS STEEL SUPER DUTY HOT CABINET SERIES

FEATURES AND BENEFITS:

- Fully insulated hot cabinet keeps prepared foods at safe serving temperatures.
- Available in Full Size, 3/4 Size or half size units with locking universal transport angles accommodate a variety of pan sizes on adjustable 1-1/2" centers.
- Powerful, yet efficient, 1500 Watt heating system maintains the right temperature to properly hold products. Heats up to 200˚F (93˚C).
- Standard solid state electronic control with large, clear, easy-to-read and operate LED digital display to ensure holding at precise food temperature.
- Internal frame in body maintains structural rigidity.
- Full perimeter bumper, rear push/pull handle and dry erase panel come standard on all models.
- Stainless steel construction throughout for ease of cleaning. One piece extended base protects cabinet body.
- Super duty composite side impact panel protection with ergonomic grips on both sides prevents damage to walls; allows for easy maneuvering.
- Insulated Dutch doors prevent temperature loss. Standard with right hand hinging; left hand hinging available upon request.
- Lockable slide bolt door latches ensure the doors stay closed even during the roughest transport.
- Smooth interior coved corners prevent food particle/grease buildup.
- Heavy duty 6" modulus casters, two with brakes. Provides mobility when fully loaded.

H-137-SUA-12D-SD

Standard solid state electronic control with large, clear, easy-to-read and operate LED digital display to ensure holding at precise food temperature

ACCESSORIES and OPTIONS (Available at extra cost):

- ❑ Extra Transport Angles
- ❑ 208 or 240 Volt Service
- ❑ Upgrade to 2000 Watt Power Unit

See page B-20 for accessory details.

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Phone: 877/CRESCOR • Fax: 440/350-7267
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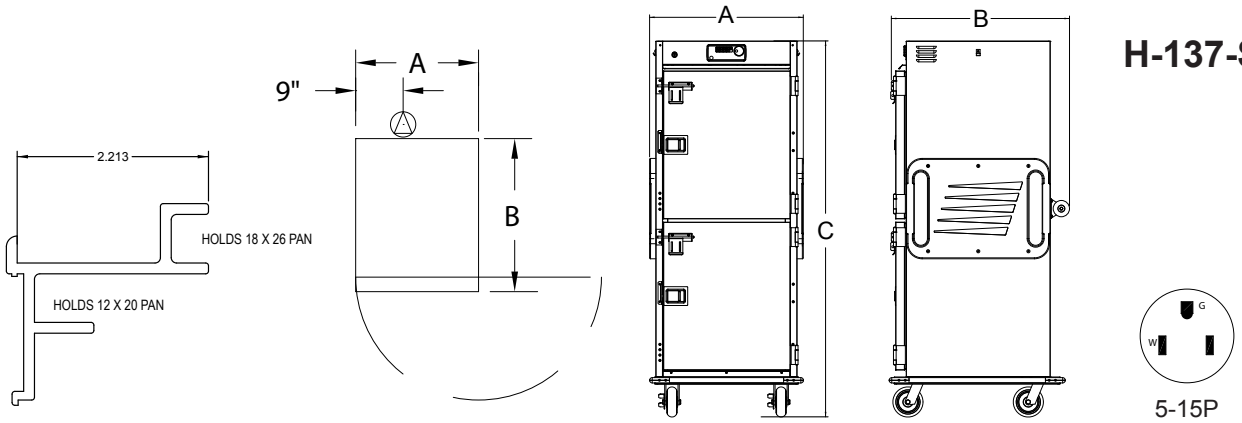
GOLD

Gold indicates our Best Insulated Hot Cabinets with the best warranty in the industry.
3-Year Parts / 1-Year Labor.



H-137-SD SERIES

CRES COR MODEL NO.	PAN			DIM "A"	DIM "B"	DIM "C"	INSIDE DIMENSIONS				WEIGHT ACT.
	CAP/ ANGLES	SIZE		WIDTH	DEPTH	HEIGHT	WIDTH	DEPTH	HEIGHT		
H-137-SUA-12D-SD	12 SETS	SEE NOTE BELOW	IN	30-1/2	34-7/8	74-3/8	22	26-7/8	58	LBS	283
			MM	775	885	1890	560	685	1475	KG	128
H-137-SUA-9D-SD	9 SETS	SEE NOTE BELOW	IN	30-1/2	34-7/8	58-5/8	22	26-7/8	42	LBS	295
			MM	775	885	1490	560	685	1070	KG	134
H-137-SUA-6D-SD	6 SETS	SEE NOTE BELOW	IN	30-1/2	34-7/8	44-3/8	22	26-7/8	28	LBS	280
			MM	775	885	1130	560	685	715	KG	127

NOTE: Pan sizes 18" x 26" (460 x 660) Bun Pans, 12" x 20" (305 x 510) Steam Table Pans.

GOLD

Gold indicates our Best Insulated Hot Cabinets with the best warranty in the industry.
3-Year Parts / 1-Year Labor.

CABINET:

- Body: 22 ga. stainless steel.
- Reinforcement: Internal framework of 18 ga. 304 stainless steel.
- Insulation: Fiberglass, thermal conductivity (K factor) is .23 at 75˚F. 1-1/2" in doors, base top; 2" in sidewalls.
- Air tunnels: 22 ga. stainless steel; lift-out type, mounted on sides.
- Push/pull handle: Welded stainless steel with end bumpers; rear mounted.
- Interior coved corners.
- Super Duty composite side impact panel with ergonomic grips.
- Supplied with magnetic white erasable board, 12" x 12".

BASE:

- One piece construction, .125 aluminum; extended in rear for toe kick.
- Casters: 6" dia., modulus tires, 2" wide, load cap. 450 lbs. each, temp. range -40˚/+180˚F. Sealed ball bearings; permanently lubricated. Front casters equipped with brakes.
- Perimeter bumper: 1" non-marking gray rubber.

DUTCH DOORS:

- Formed 22 ga. stainless steel.
- Hinges: 11 ga. stainless steel, butt type.
- Gaskets: Perimeter type, silicone.
- Pan stop: Embossed.
- Latches: Polished stainless steel, slam type; flush mounted.
- Transport Latch: 12 ga. stainless steel slide with lockable hasp.

TRANSPORT PAN SLIDES:

- Extruded aluminum; mounted on locking lift-off posts.
- Spaced on 4-1/2" centers; adjustable on 1-1/2" centers.

Scan QR code to view Spec Sheet, Operating Manual, Wiring Diagram or to call Customer Service.

If you need a QR reader visit your App Store on your Smartphone or Tablet.

HOT UNIT COMPONENTS:

- Thermostat: Solid state digital display control, room ambient to 200˚F (93˚C).
- Switch: ON-OFF push button type.
- Power cord: Permanent, 10 ft., 14/3 ga.
- Heater: 1470 Watts (960 Watts for -UA6D)
- Blower motor.
- Vent Fan.
- Thermometer: Digital.

POWER REQUIREMENTS:

- For H137SUA9D and H137SUA12D: 1500 Watts, 120 Volts, 60 Hz., single phase, 12 Amps., 15 Amp. service.
- For H137SUA6D: 1000 Watts, 120 Volts, 60 Hz., single phase, 8.3 Amps., 15 Amp. service.

SHORT FORM SPECIFICATIONS

Cres Cor Insulated Hot Cabinet Model H-137-SUA-___D. Solid state electronic controlled time and temperatures. Cabinet 22 ga. stainless steel; stainless steel internal frame. (__) sets locking transport angles for multiple pan sizes, adjustable spacing every 1-1/2". Dutch doors, 22 ga. stainless steel. Fiberglass insulation in sides, 2"; doors, base, top 1-1/2". Interior coved corners. 1500 or 1000 Watt, 120 Volt power unit. One piece insulated base, .125 aluminum. 6" modulus casters, ball bearings. Load capacity 450 lbs. each. 3-Year Parts / 1-Year Labor warranty. Provide the following accessories: ____ ____ ____ . NSF, CSA-US, CSA-C listed. Energy Star Qualified.

CRES COR®
5925 Heisley Road • Mentor, OH 44060-1833
Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com

In line with its policy to continually improve its products, CRES COR reserves the right to change materials and specifications without notice.

Litho in U.S.A.

CRES COR®

JOB: _____

ITEM NO: _____

SUPER DUTY
CHILLTEMP® REFRIGERATED CABINET
MODEL R-171-SUA-10E-SD

FEATURES AND BENEFITS:

- Super duty composite side impact panel protection with ergonomic grips on both sides prevents damage to walls; allows for easy maneuvering.
- Fully insulated mobile ChillTemp® refrigerated cabinet for holding food and beverages at serving temperature.
- Lockable slide bolt door latches ensure the doors stay closed even during the roughest transport.
- Forced air system provides even distribution of cold air; cabinet maintains temperatures from 33˚F (.5˚ C) to 40˚F (4.5˚ C). Automatically defrosts.
- 1/3 horsepower compressor with automatic overload reset. R134a refrigerant for environmental compatibility.
- Full perimeter bumper, rear push/pull handle and dry erase panel come standard on all models.
- Stainless steel construction throughout for ease of cleaning. One piece extended base protects cabinet body.
- Self-closing insulated door prevents temperature loss. Magnetic door gaskets for proper seal.
- Insulated door prevents temperature loss. Standard with right hand hinging; left hand hinging available upon request.
- Generous 18-cubic foot interior.
- Ten sets of chrome plated wire angles accommodate a large variety of pan sizes on adjustable 1-1/2" centers.
- Heavy duty 6" modulus casters, two with brakes. Provides mobility when fully loaded.

C US

SANITATION NSF/ANSI 7

R-171-SUA-10E-SD

ACCESSORIES and OPTIONS (Available at extra cost):

- ❑ Menu Card Holder
- ❑ Corner Bumpers
- ❑ Polyurethane Casters
- ❑ 240 Volt Service
- ❑ Digital Thermometer
- ❑ Interior for (28) 18" x 26" pans

See page K-4 for accessory details.

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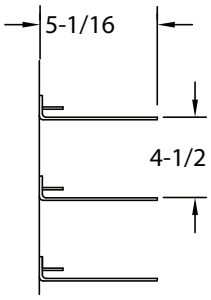
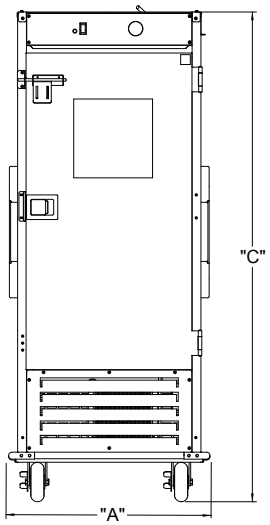
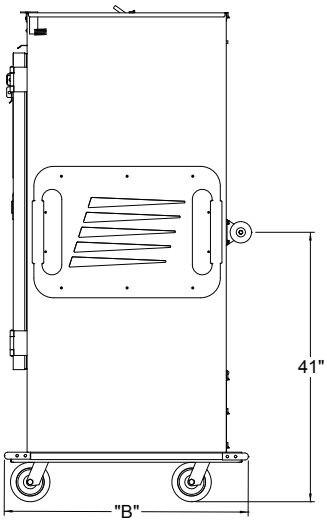
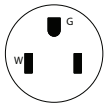
R-171-SUA-10E-SD



DETAIL OF
PAN SLIDE







5-15 P

CRES COR MODEL NO.	PAN			DIM "A"	DIM "B"	DIM "C"	INSIDE DIMENSIONS				WEIGHT ACT.
	CAP/ ANGLES	SIZE		WIDTH	DEPTH	HEIGHT	WIDTH	DEPTH	HEIGHT		
R-171-SUA-10E-SD	10 SETS	18 X 26	IN	30-7/16	40-1/2	77-1/8	23-1/2	29-3/4	47-3/8	LBS	408
			MM	773	1029	1959	597	755	1203	KG	186
	20 SETS	12 X 20	IN								
			MM								

CABINET:
- Body: 22 ga. stainless steel.
- Reinforcement: Internal framework of 18 ga. 304 stainless steel.
- Insulation: Fiberglass, thermal conductivity (K factor) is .23 at 75˚F. 1-1/2" in doors, base top; 2" in sidewalls.
- Push/pull handle: Welded stainless steel with end bumpers; rear mounted.
- Interior coved corners.
- Super Duty composite side impact panel with ergonomic grips.
- Supplied with magnetic white erasable board, 12" x 12".

BASE:
- One piece construction, .125 aluminum; extended in rear for toe kick.
- Casters: 6" dia., modulus tires, 2" wide, load cap. 450 lbs. each, temp. range -40˚/+180˚F. Sealed ball bearings; permanently lubricated. Front casters equipped with brakes.
- Perimeter bumper: 1" non-marking gray rubber.

DOOR:
- Formed 22 ga. stainless steel.
- Hinges: 11 ga. stainless steel, butt type.
- Gasket: Perimeter type, silicone.
- Pan stop: Embossed.
- Latch: Polished stainless steel, slam type; flush mounted.
- Transport Latch: 12 ga. stainless steel slide with lockable hasp.

PAN SLIDES:
- Wire angles (.306 dia.), nickel chrome plated steel, mounted on lift-off posts.
- Spaced on 4-1/2" centers; adjustable on 1-1/2" centers.

ELECTRICAL COMPONENTS:
- Thermostat: Pre-set to 38˚ F (3.3˚ C).
- Pilot light.
- Switch.
- Power cord: Permanent, 10 ft., 14/3 ga. with molded plug.
- Compressor: 1/3 h.p.
- Condensate evaporator: Electrical.
- R134a refrigerant.

POWER REQUIREMENTS:
- 120 Volts, 60 Hz., single phase, 15 Amp. service.

SHORT FORM SPECIFICATIONS

Cres Cor Refrigerated Cabinet Model R-171-SUA-10E-SD. Cabinet 22 ga. stainless steel; stainless steel internal frame. (10) sets of wire universal angles for multiple pan sizes, adjustable spacing every 1-1/2". Door, 22 ga. stainless steel. Foam insulation in sides and doors. Interior coved corners. 1/3 h.p. compressor, 120 Volts. One piece base, .125 aluminum. 6" swivel casters, ball bearings. Load capacity 450 lbs. each. 2-Year Parts / 1-Year Labor warranty. Provide the following accessories: _____ _____ _____. CSA-US/C, CSA to NSF7 listed.

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Made in America Since 1936

BEVERAGE-AIR

Project: _____	AIA#
Item: _____	
Location: _____	SIS#
Approved:	

SCHOOL MILK COLD WALL COOLER

SM58HC Single Access Cooler
Hydrocarbon Series

MODEL:
SM58HC-S

3 Year Parts/Labor Warranty
Additional 4 Year Compressor Warranty

CABINET CONSTRUCTION

- Stainless steel exterior and interior
- Stainless steel lids, hinges doors and door latches
- Full electronic control
- Heavy-duty epoxy coated steel wire floor racks standard
- Floor drain is centrally located for easy cleaning, connecting to drain hose with hose adapter
- Flexible compression door gaskets ensure tight seal
- Self-latching doors/lids with safety bumpers
- Exterior thermometer
- Cylinder lock
- 4" Heavy-duty plate casters (2 with locks)
- Cold wall milk coolers are designed to hold product temperature during service. Product should be removed at the end of service and moved to long-term, refrigerated storage.

OPTIONS & ACCESSORIES

- Corner bumpers
- Cafeteria tray slide
- Graphics

REFRIGERATION SYSTEM

- Uses environmentally friendly, energy efficient R290 refrigerant, and meets all regulatory requirements for CARB, SNAP, DOE & more
- Maintains product temperature between 36º to 40ºF

SM58HC SINGLE ACCESS, COLD WALL: SCHOOL MILK SERIES

Please verify qualifying units by visiting:
www.energystar.gov/cfs

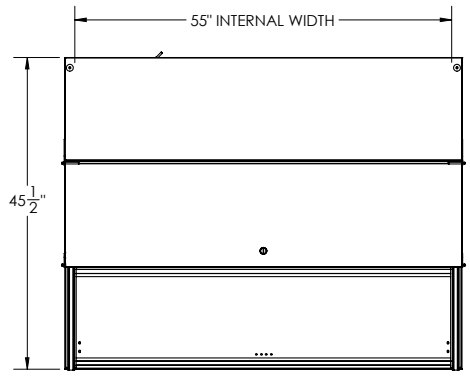
3779 Champion Blvd., Winston-Salem, NC 27105
1-888-845-9800 Fax: 1-336-245-6453
Beverage-Air.com Sales@bevair.com

BEVERAGE-AIR

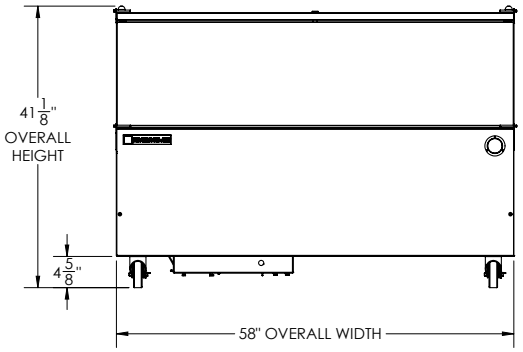
School Milk Cooler - Single Access
Model: SM58HC-S

MODEL	SM58HC-S
EXTERNAL DIMENSIONAL DATA	
Width Overall	58”
Depth Overall	30 ⅝”
Height Overall with Casters	41 ⅛”
Number of Lids/Doors	Single Access
Depth with Door Open 90º	45 ½”
INTERNAL DIMENSIONAL DATA	
NET Capacity (cubic ft.)	22.63
Internal Width Overall (in)	55”
Internal Depth Overall (in)	27”
Internal Height Usable (in)	25 ¾”
CASE CAPACITY	
13” X 13” X 11”	16
19” X 13” X 11”	10
ELECTRICAL DATA	
Full Load Amperes	2.2
REFRIGERATION DATA	
Horsepower	1/3
Capacity (BTU/Hr)	1434
SHIPPING DATA	
Gross Weight	384 lbs
Height - Crated	48”
Width - Crated	61”
Depth - Crated	34”

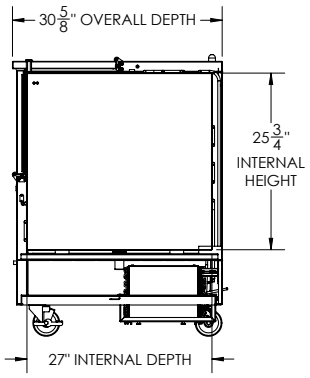
Model Views



PLAN VIEW



ELEVATION VIEW



SIDE VIEW

ELECTRICAL CONNECTION

115/60/1
NEMA 5-15P

Units pre-wired at factory and include 8’ long cord and plug set.

PIPER ELITE 500

Bloomington Cold

Extra Deep Cold Pan - Listed NSF/ANSI Standard 7

3-BCM-SD

The Piper Elite 500 Bloomington mechanically refrigerated, extra deep well unit is listed NSF/ANSI Standard 7. Food is recessed on easily removable rails in the pan for maximum cooling efficiency without the use of ice and is ideal as a salad bar merchandiser. Elite 500 units are compatible and will interlock with other Elite 500 units.

STANDARD FEATURES

- 14-gauge stainless steel top with 1-1/2" turndown on all sides
- Top secured by four recessed bolts for easy access
- 14-gauge stainless steel legs fastened to 18-gauge stainless steel bottom shelf
- 20-gauge stainless steel end and front panels are attached to legs
- 20-gauge stainless steel fully welded 9-7/16" deep well
- Welded watertight well has concealed continuous refrigerated coil bonded to the sides and is fully insulated
- Cold pan has a 1" drain with shut off valve located below the unit on operator's left side. Valve is 3/4" FTP.
- Sliding doors
- Louvered panels for ventilation of condensing unit
- End louver panel removable to access compressor
- 5" diameter swivel plate casters, 2 with brakes
- Interlocking mechanism is provided to interlock with other Elite 500 units

JOB_____ ITEM # _____ QTY # _____

MODEL NUMBER

- ❑ 2-BCM
- ❑ 3-BCM
- ❑ 4-BCM
- ❑ 5-BCM
- ❑ 6-BCM

DIMENSIONS

- 2-BCM - 36"H x 28"D x 32"L
- 3-BCM - 36"H x 28"D x 46"L
- 4-BCM - 36"H x 28"D x 60"L
- 5-BCM - 36"H x 28"D x 74"L
- 6-BCM - 36"H x 28"D x 88"L
- 36" height on all standard units
- 30" height is available on Petite Elite units
- 28" width
- 32" to 88" length in 14" increments
- **Optional: Pizzazz Powder Coating in lieu of Stainless Steel**

NSF/ANSI STANDARD 7

This unit is listed with CSA in NSF/ANSI Standard 7 for design and construction and has been performance tested for the storage of potentially hazardous foods. The performance test criteria is holding a food-like media at or below 41°F without any freezing for four hours at 86°F ambient temperature.

ELECTRICAL

- 120 volts single-phase
- Eight foot electrical cord with NEMA 5-15P plug
- On/Off switch and pilot light mounted on control panel of unit's operator side

REFRIGERATION SYSTEM

- 1/3 horsepower compressor
- Fan-cooled condensing unit with an expansion valve pressure control switch
- Refrigerant coils shall be of copper tubing wrapped around the sides of the well

WARRANTY

- One year parts and labor. Warranty is detailed on inside front cover of the price list.

SPEC A-5

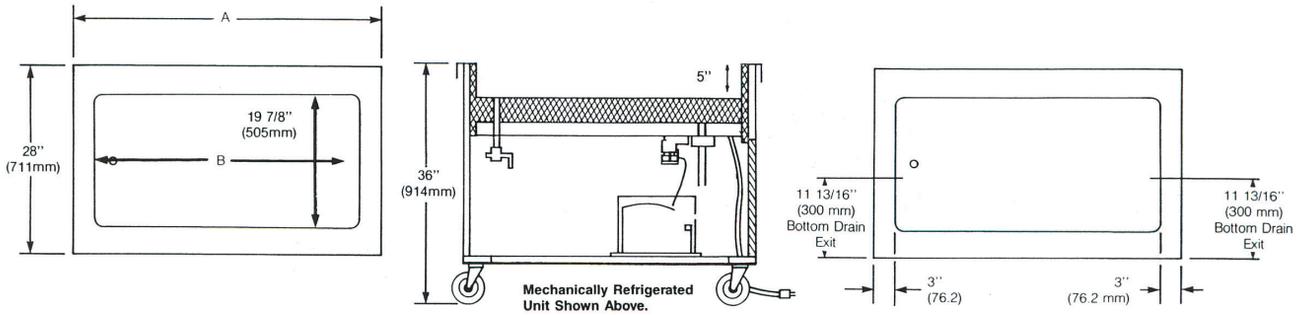
PIPER
The Food-Focused Equipment Company
a CFSBRANDS company
www.piperonline.net

300 S. 84th Avenue
Wausau, WI 54401
Phone: 800-544-3057
Fax: 715-842-3125

PIPER ELITE 500

Bloomington Cold

Extra Deep Cold Pan - Listed NSF/ANSI Standard 7



BLOOMINGTON COLD FOOD UNIT SPECIFICATIONS

Model#	*12x20 Pan Capacity	(A)	(B)	Width	Height	*Amperage 120V	*NEMA Cap No.	Ship Wt. (lbs)
2-BCM	2	32"	36.25"	28"	36"	6.3	5-15P	320
3-BCM	3	46"	40.25"	28"	36"	6.3	5-15P	360
4-BCM	4	60"	54.25"	28"	36"	6.3	5-15P	405
5-BCM	5	74"	68.25"	28"	36"	6.3	5-15P	440
6-BCM	6	88"	82.25"	28"	36"	6.3	5-15P	480

*Amperage/NEMA plug type may vary with options.

DIMENSION ADDITIONS FOR OPTIONS

- Add 23-3/4" to height for buffet protector guard
- Add 14" to height for cafeteria protector guard
- Add 22-3/4" to height for double display shelf
- Add 8" to width for cutting board
- Add 12-3/4" to width for solid ribbed tray slide
- Add 12-1/2" to width for 3-bar tray slide

Note: Line-up drawing required when ordering false front, cashier stand or interconnected units.

OPTIONS / ACCESSORIES

	Part #	Description
❑	PPC	Pizzazz Powder Coating
❑	SCB	8" stainless steel cutting board, flush with top
❑	MCB	8" maple cutting board, flush with top
❑	SRTS	Solid 3-ribbed tray slide, 16-gauge stainless steel
❑	3BTS	3-bar tray slide
❑	MBS	18" maple end bread shelf; left, right - flush with top
❑	SBS	18" stainless steel end bread shelf; left, right - flush with top
❑	CPG	Cafeteria protector guard (no heat or lights)
❑	CPGL	Cafeteria protector guard with incandescent lights
❑	CPGFL	Cafeteria protector guard with fluorescent lights
❑	CPGHL	Cafeteria protector guard with heat and lights
❑	CDD	Cafeteria double display (no heat or lights)
❑	CDDL	Cafeteria double display with fluorescent lights
❑	BPG1	Buffet single side protector guard (no heat or lights)
❑	BPG1IL	Buffet single side protector guard with incandescent lights
❑	BPG1FL	Buffet single side protector guard with fluorescent lights
❑	BPG	Buffet double side protector guard (no heat or lights)

	Part #	Description
❑	BPGIL	Buffet double side protector guard with incandescent lights
❑	BPGFL	Buffet double side protector guard with fluorescent lights
❑	BPGH	Buffet double side protector guard with heat strip
❑	BDD	Buffet double display two-sided protector guard
❑	BPGC	Buffet classic two-sided protector guards
❑	CPGC	Cafeteria Style Classic (1-5/8) protector guards
❑	CDDC	Cafeteria Style Classic Double Display protector guards
❑	BPG1C	Buffet Style Classic Single Sided protector guards
❑	SCPGC	Cafeteria Style Classic Single protector guards
❑	SSL	Legs in lieu of casters
❑	DOUT	Duplex outlet (120V, 15 AMP)
❑	FRMAD	Formica laminate finish without doors
❑	CUT	Cut out for drop in dispensers.
❑	UCR-1	Refrigerated storage base with doors - for units 60" or larger
❑	UCR-2	Refrigerated storage base 74" or larger
❑	SKR	Skirting
❑	CEG	Cafeteria end guards, right or left
❑	HD	Hinged doors

A-5 SPEC

PIPER
The Food-Focused Equipment Company
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www.piperonline.net

300 S. 84th Avenue
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Phone: 800-544-3057
Fax: 715-842-3125

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- [ ] RESUBMIT WITH CORRECTIONS

SIGNATURE

DATE

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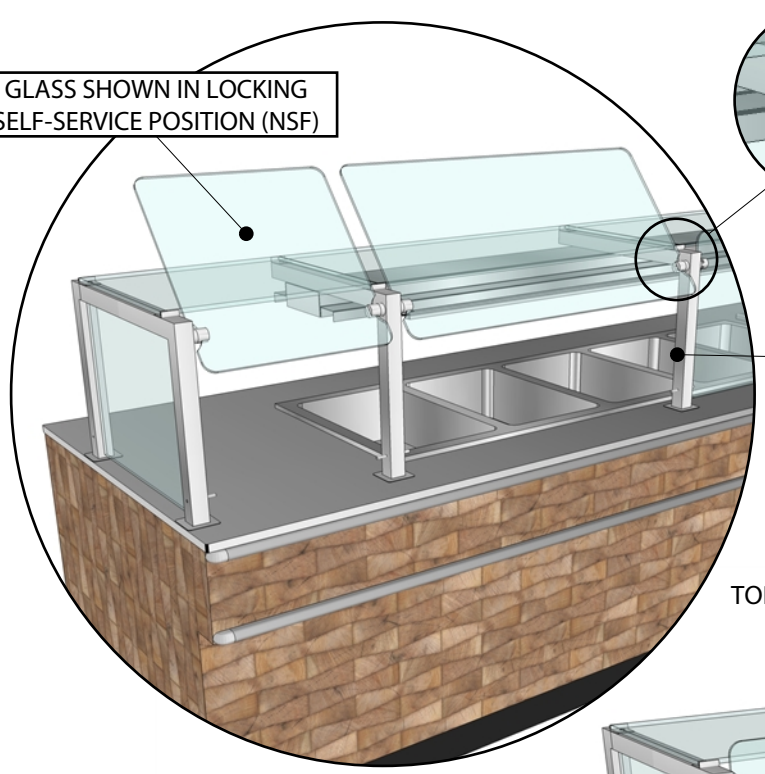

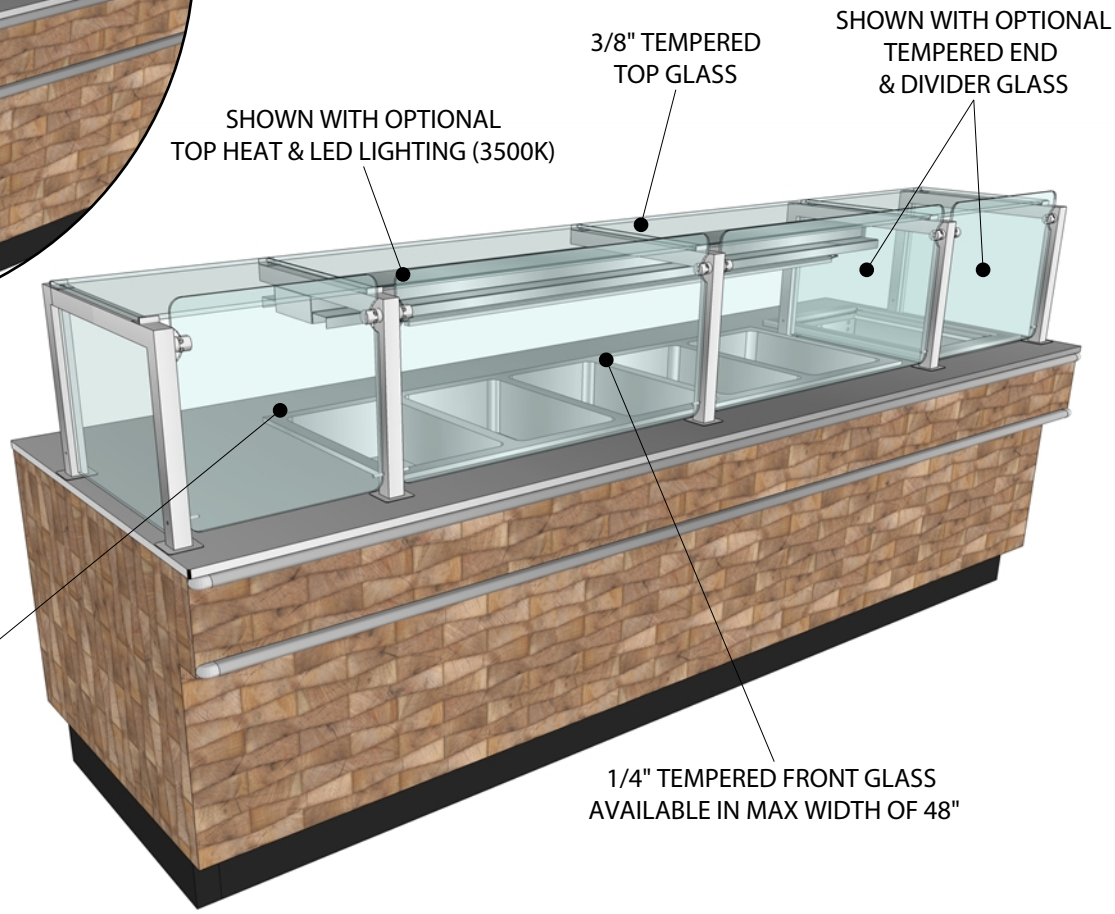

CONVERTIBLE GUARD SHOWN ON PIPER INLINE HOT/COLD BAR

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS	
1	NTE 3/7/2018

Drawn By:NTE

Date: 1-31-2018

Sheet No.
1 of 5

Project #
45700-01

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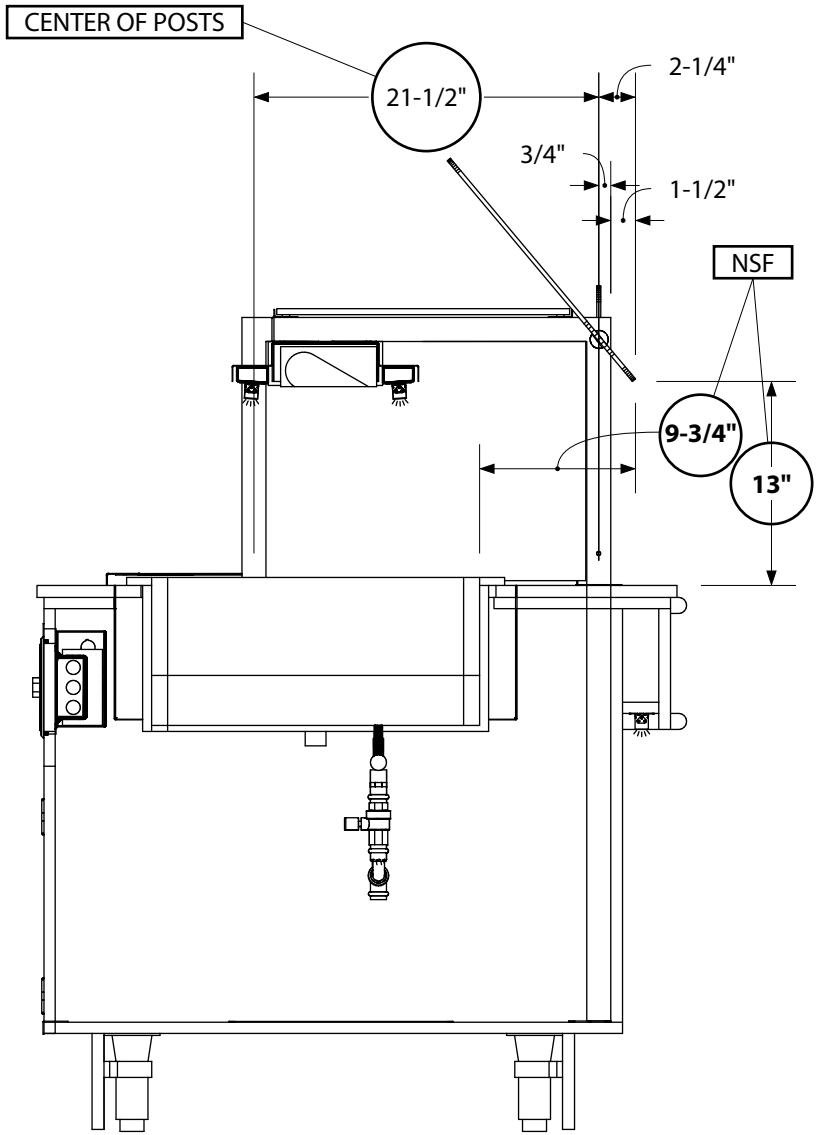
TYPICAL ALIGNMENT OF FOOD PAN IN REFERENCE TO SELF-SERVICE GLASS (NSF)



1 Section View - NSF

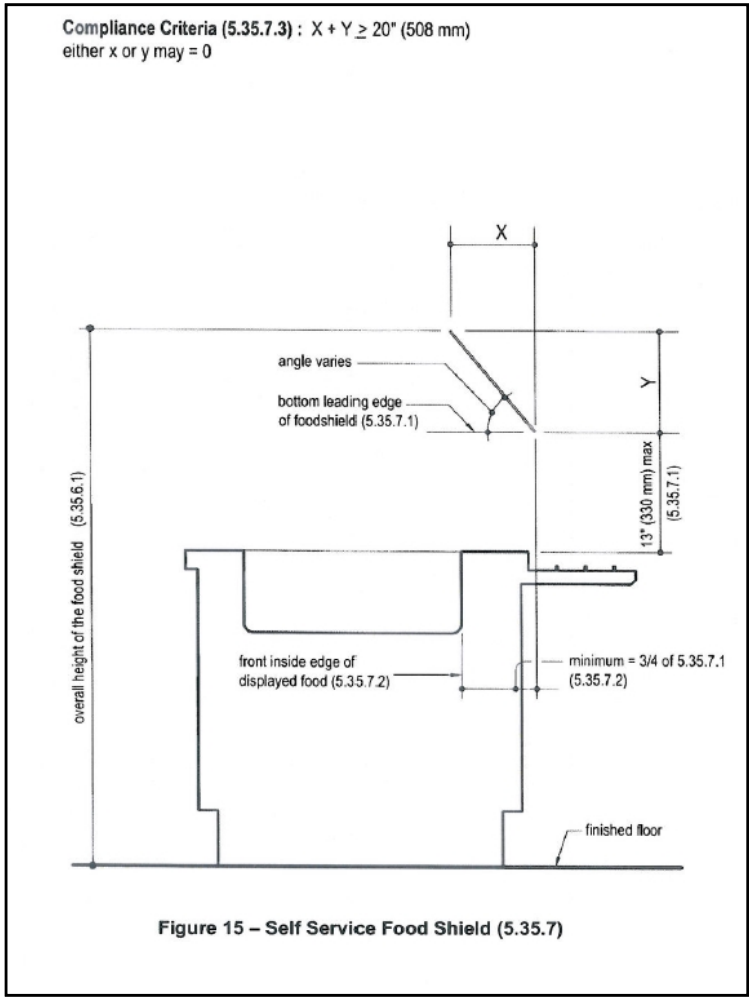


Figure 15 – Self Service Food Shield (5.35.7)

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS

1	NTE 3/7/2018

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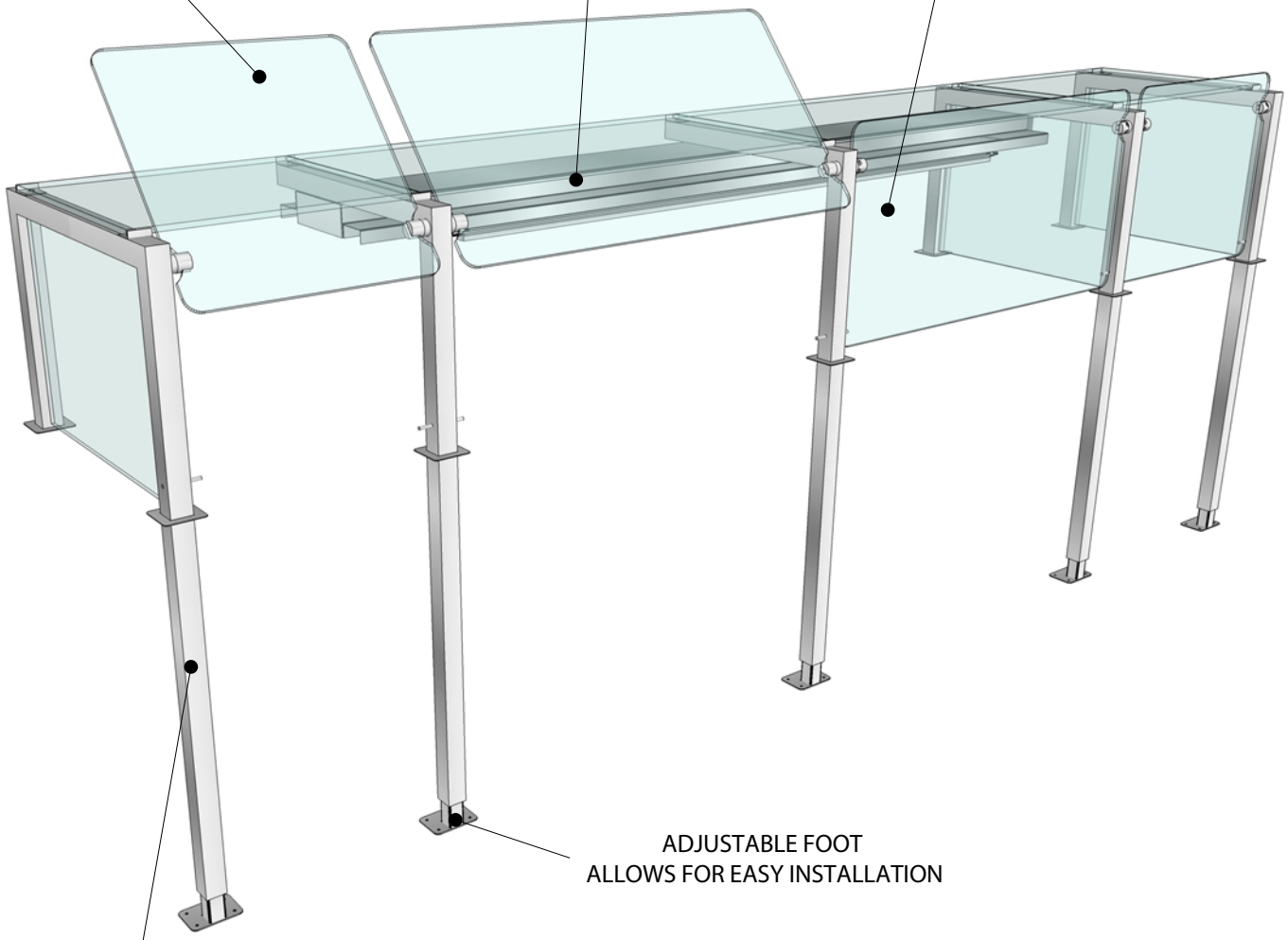
sales@rdfixtures.com

AVAILABLE IN OVERHEAD LED LIGHTING
OR OVERHEAD HEAT WITH LED LIGHTING
BOTH WITH STAINLESS STEEL SHROUD

GLASS SHOWN IN SELF-SERVICE POSITION

GLASS SHOWN IN SERVICE POSITION



ADJUSTABLE FOOT
ALLOWS FOR EASY INSTALLATION

FRONT SQUARE TUBING EXTENDS THROUGH COUNTERTOP
FOR ADDED STRENGTH AND INCREASED SPAN
(OPTIONAL SHORTER FRONT POSTS FOR SHORTER SPANS)

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS	
1	NTE 3/7/2018

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Date: 1-31-2018

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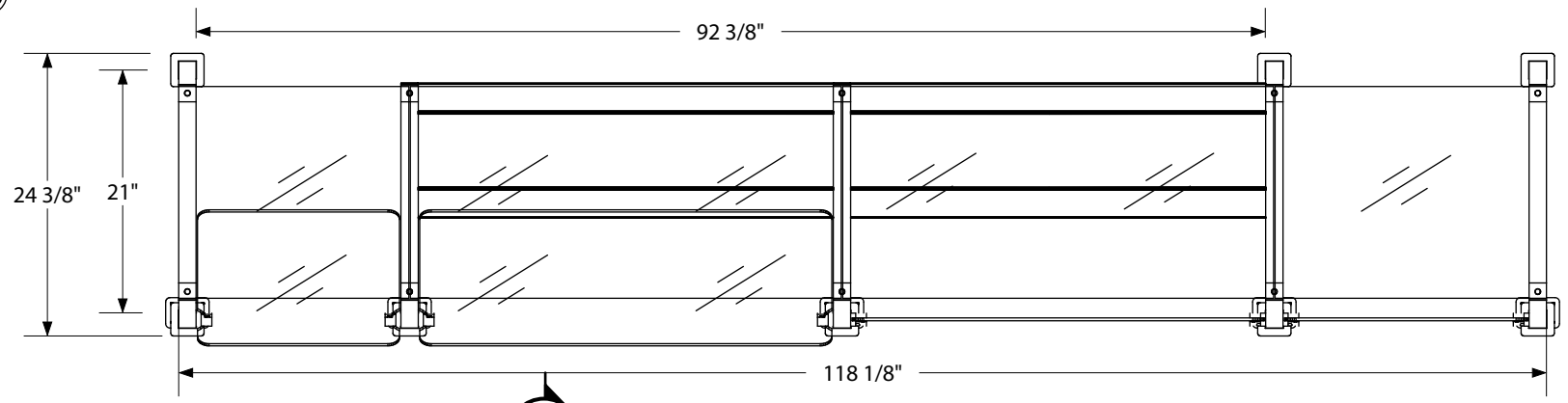
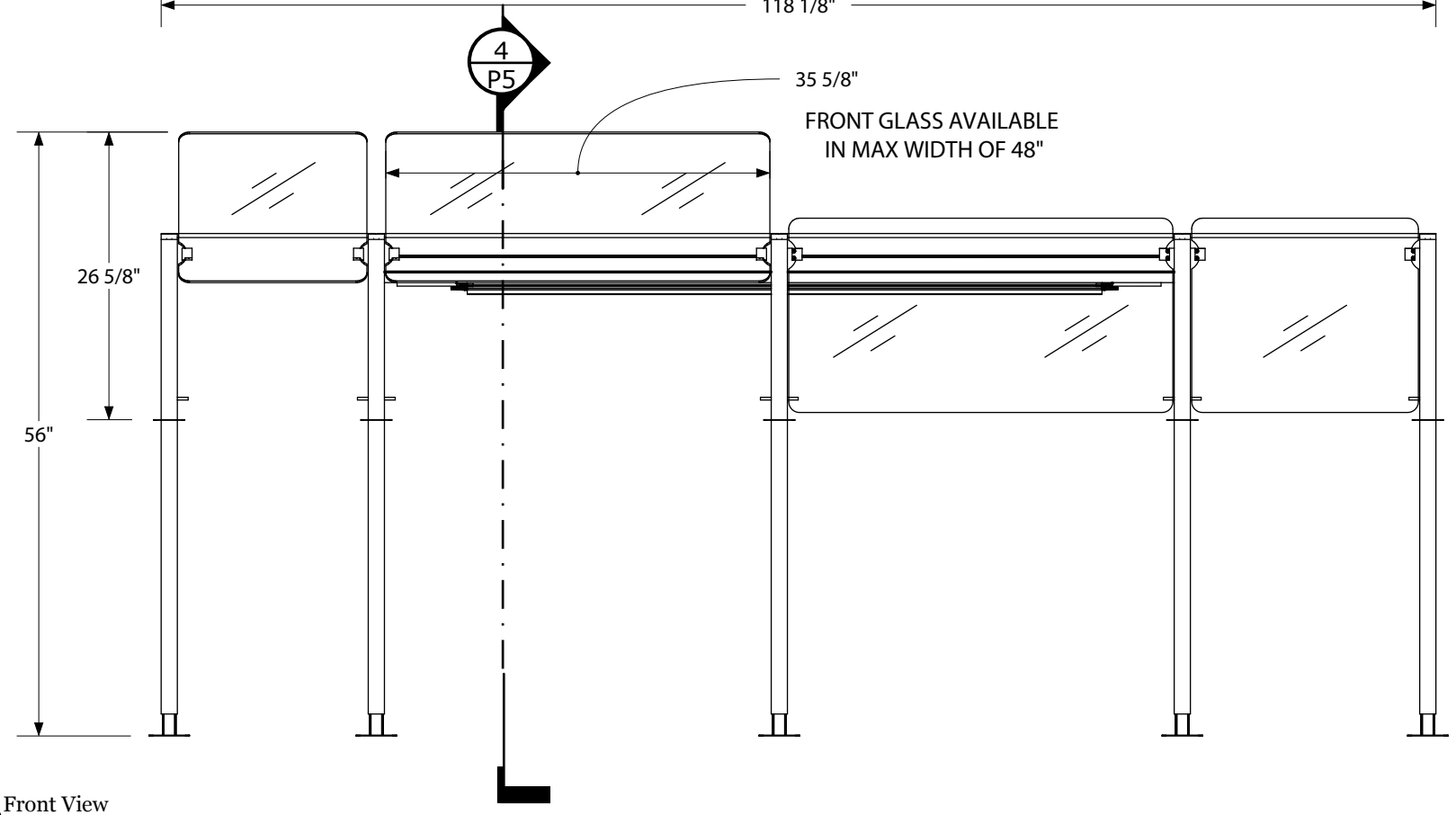
2 Plan View





3 Front View

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS

1	NTE 3/7/2018

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Sheet No.
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45700-01

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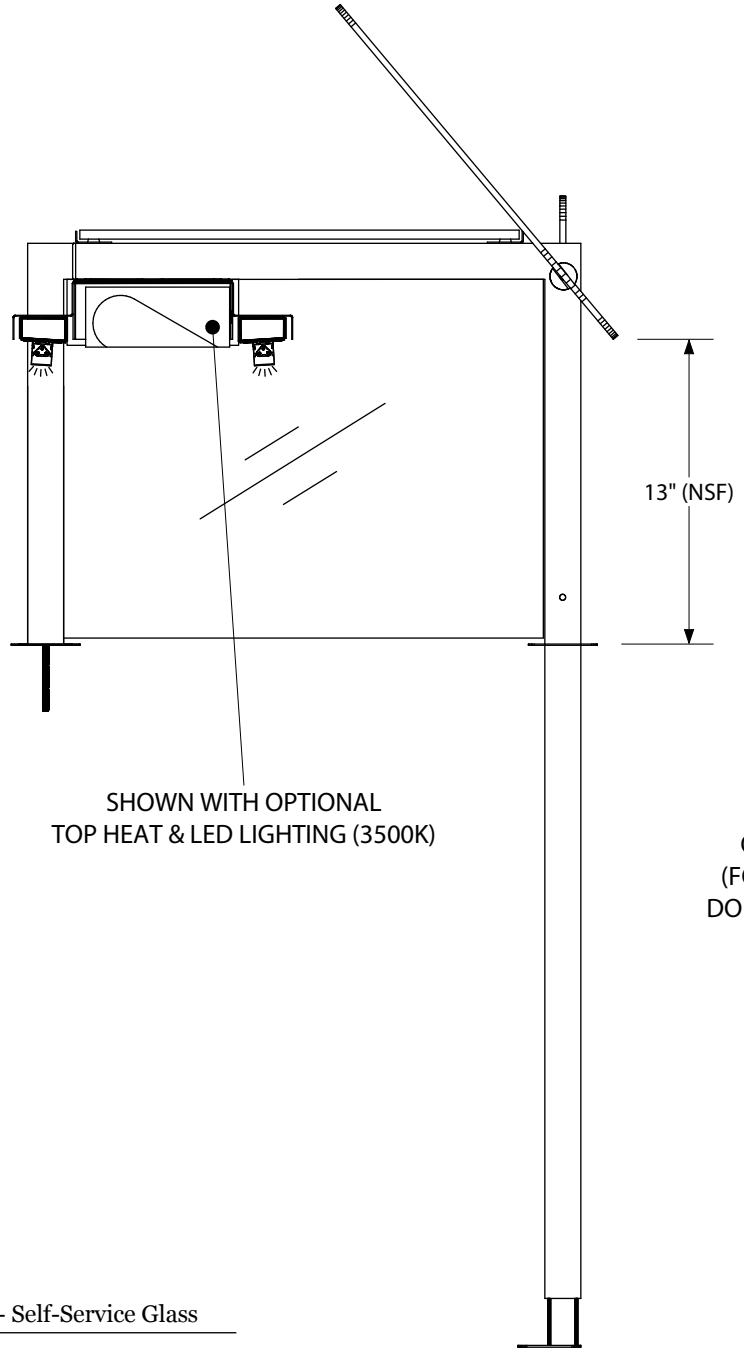

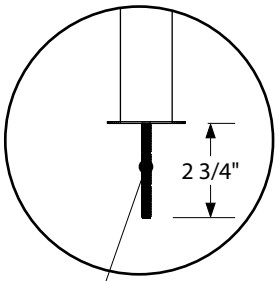

OPTIONAL BOLTED FRONT POST
(FOR SMALLER APPLICATIONS THAT
DO NOT REQUIRE A LARGE REAR SPAN)

4 Section View - Self-Service Glass

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CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS

1	NTE 3/7/2018

Drawn By:NTE

Date: 1-31-2018

Sheet No.
5 of 5

Project #
45700-01

PIPER ELITE 500

Solid Top Unit

3-ST shown with optional elementary height solid tray slide and formica finish

The Elite 500 Solid Top's versatile modular design allows you to custom design either a cafeteria or a buffet line-up. Elite 500 units are compatible and will interlock with other Elite 500 units. This allows the units to be disconnected for cleaning under the serving line. With Elite 500 you choose only the options and accessories that you want and need.

STANDARD FEATURES

- 14-gauge stainless steel top with 1-1/2" turn down on all sides
- Top secured by four recessed bolts
- 14-gauge stainless steel legs fastened to 18-gauge stainless steel bottom shelf
- 20-gauge stainless steel end and front panels are attached to legs
- Open control side for additional storage capacity
- 5" diameter swivel plate casters, 2 with brakes
- Interlocking mechanism is provided to interlock with other Elite 500 units

JOB_____ ITEM # _____ QTY # _____

MODEL NUMBER

- ❑ 2-ST (500)
- ❑ 3-ST (500-1)
- ❑ 4-ST (500-2)
- ❑ 5-ST (500-3)
- ❑ 6-ST (500-4)

DIMENSIONS

- 2-ST(500) - 36"H x 28"D x 32"L
- 3-ST(500-1) - 36"H x 28"D x 46"L
- 4-ST(500-2) - 36"H x 28"D x 60"L
- 5-ST (500-3)- 36"H x 28"D x 74"L
- 6-ST(500-4) - 36"H x 28"D x 88"L
- 36" height on all standard units
- 30" height is available on Petite Elite units
- 28" width
- 32" to 88" length in 14" increments

COMMON OPTIONS

- **PIZZAZZ POWDER COATING IN LIEU OF STAINLESS STEEL**
- Tray slides
- Protector guards
- Hinged or sliding doors
- See reverse side for additional options.

WARRANTY

One year parts and labor. Warranty is detailed on inside front cover of the price list.

SPEC A-3

PIPER
The Food-Focused Equipment Company
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Wausau, WI 54401
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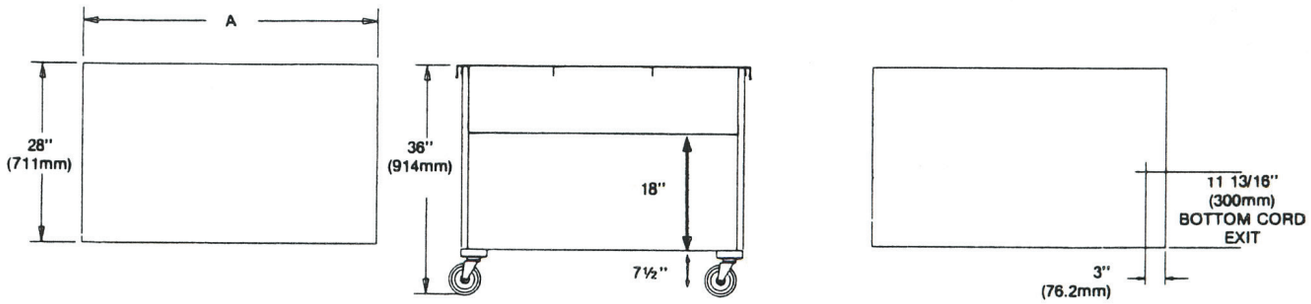
PIPER ELITE 500

Solid Top Unit



SOLID TOP UNIT SPECIFICATIONS

Model#	Length	Width	Height	Ship Wt. (lbs)
2-ST(500)	32”	28”	36”	225
3-ST(500-1)	46”	28”	36”	265
4-ST(500-2)	60”	28”	36”	302
5-ST(500-3)	74”	28”	36”	345
6-ST(500-4)	88”	28”	36”	385

DIMENSION ADDITIONS FOR OPTIONS

- ❑ Add 23-3/4” to height for buffet protector guard
- ❑ Add 14” to height for cafeteria protector guard
- ❑ Add 22-3/4” to height for double display shelf
- ❑ Add 8” to width for cutting board
- ❑ Add 12-3/4” to width for solid ribbed tray slide
- ❑ Add 12-1/2” to width for 3-bar tray slide

Note: Line-up drawing required when ordering false front, cashier stand or interconnected units.

OPTIONS / ACCESSORIES

	Part #	Description
❑	PPC	Pizzazz Powder Coating
❑	SCB	8” stainless steel cutting board, flush with top
❑	MCB	8” maple cutting board, flush with top
❑	SRTS	Solid 3-ribbed tray slide, 16-gauge stainless steel
❑	3BTS	3-bar tray slide
❑	MBS	18” maple end bread shelf; left, right - flush with top
❑	SBS	18” stainless steel end bread shelf; left, right - flush with top
❑	CPG	Cafeteria protector guard (no heat or lights)
❑	CPGL	Cafeteria protector guard with incandescent lights
❑	CPGFL	Cafeteria protector guard with fluorescent lights
❑	CPGHL	Cafeteria protector guard with heat and lights
❑	CDD	Cafeteria double display (no heat or lights)
❑	CDDL	Cafeteria double display with fluorescent lights
❑	BPG1	Buffet single side protector guard (no heat or lights)
❑	BPG1IL	Buffet single side protector guard with incandescent lights
❑	BPG1FL	Buffet single side protector guard with fluorescent lights

	Part #	Description
❑	BPG	Buffet double side protector guard (no heat or lights)
❑	BPGIL	Buffet double side protector guard with incandescent lights
❑	BPGFL	Buffet double side protector guard with fluorescent lights
❑	BPGH	Buffet double side protector guard with heat strip
❑	BDD	Buffet double display two-sided protector guard
❑	BPGC	Buffet classic two-sided protector guards
❑	CPGC	Cafeteria Style Classic (1-5/8) protector guards
❑	CDDC	Cafeteria Style Classic Double Display protector guards
❑	BPG1C	Buffet Style Classic Single Sided protector guards
❑	SCPGC	Cafeteria Style Classic Single protector guards
❑	SSL	Legs in lieu of casters
❑	DOUT	Duplex outlet (120V, 15 AMP)
❑	FRMA	Formica laminate finish without doors
❑	CUT	Cut out for drop in dispensers.
❑	UCR-1	Refrigerated storage base with doors - for units 60” or larger
❑	UCR-2	Refrigerated storage base 74” or larger
❑	INT	Intermediate shelf

A-3 SPEC

PIPER
The Food-Focused Equipment Company
a CFSBRANDS company
www.piperonline.net

300 S. 84th Avenue
Wausau, WI 54401
Phone: 800-544-3057
Fax: 715-842-3125

PIPER ELITE 500

Hot Food Unit

JOB_____ ITEM # _____ QTY # _____

MODEL NUMBER

- ❑ 2-HF (501-2)
- ❑ 3-HF (501-3)
- ❑ 4-HF (501-4)
- ❑ 5-HF (501-5)
- ❑ 6-HF (501-6)

FoodSafe™

3-HF Elite 500 shown with optional 3-bar tray slide and formica finish

The versatile modular design of the Elite 500 Serving System Hot Food units allows you to customize your cafeteria or a buffet line-up. Elite 500 units are compatible and will interlock with other Elite 500 units. This design allows the units to be disconnected for cleaning under the serving line. With Elite 500 you choose only the options and accessories that you want and need for your line-up.

Only Piper's equipment has the advantage of FoodSafe technology and certification. This ensures that your food is kept "out of the **Danger-Zone**." Food spoilage occurs mainly because of rapidly accelerated bacteriological activity within the 40F-140F **"Danger Zone."**

With FoodSafe hot food stays above 140F longer and cold food is kept below 40F. Both are key factors in HACCP compliance and the fight against foodborne pathogens.

STANDARD FEATURES

- 14-gauge stainless steel top with 1-1/2" turndown on all sides
- Top secured by four recessed bolts for easy access
- 14-gauge stainless steel legs fastened to
- 18-gauge stainless steel bottom shelf, open control side
- Open control side for additional storage capacity
- 20-gauge stainless steel end and front panels are attached to legs
- 20-gauge stainless steel bottom-mounted wells, 6-1/2" deep with coved corners
- 2" insulation on sides and between wells, 1-1/2" on bottom, 1" on the ends and 1/4" fiber frax all around
- 1000 watt tubular heating element for each well is individually and thermostatically controlled
- Wells can be run wet or dry
- 5" diameter swivel plate casters, 2 with brakes
- Interlocking mechanism is provided to interlock with other Elite 500 units.
- Drain valve exits operator's left side as standard. Drain valve is 3/4" FPT.
- Common drains and manifolds

DIMENSIONS

- 2-HF (501-2) - 36"H x 28"D x 32"L
- 3-HF (501-3) - 36"H x 28"D x 46"L
- 4-HF (501-4) - 36"H x 28"D x 60"L
- 5-HF (501-5) - 36"H x 28"D x 74"L
- 6-HF (501-6) - 36"H x 28"D x 88"L
- 36" height on all standard units
- 30" height is available on Petite Elite 500 units
- 28" width
- 32" to 88" length in 14" increments

ELECTRICAL

- Two, three and four well units are available 120 volts
- All units available in 208 or 240 volt, single- phase standard
- Eight foot electrical cord and plug
- Some options or accessories may not be available with certain voltages

COMMON OPTIONS

- **PIZZAZZ POWDER COATING IN LIEU OF STAINLESS STEEL**
- Tray slides
- Protector guards
- Hinged or sliding doors
- See reverse side for additional options

WARRANTY

One year parts and labor. Warranty is detailed on inside front cover of the price list.

SPEC A-1

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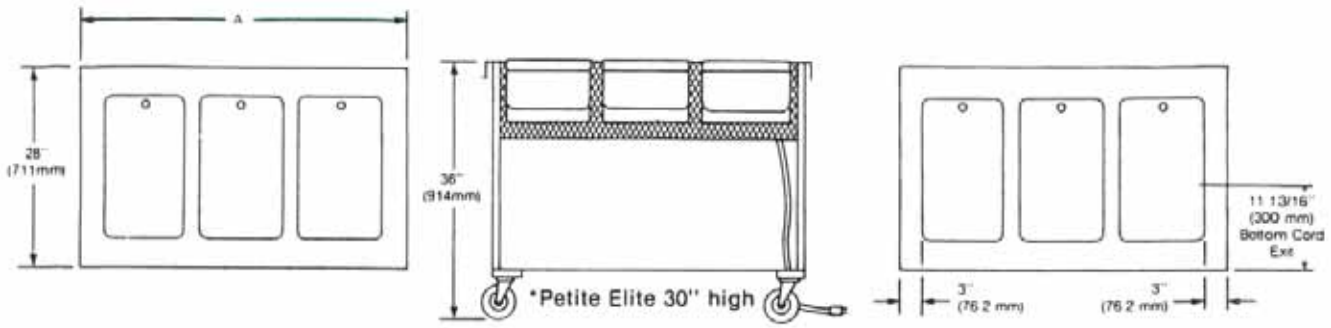
PIPER ELITE 500

Hot Food Unit



Model#	# of Wells	A	Watts	120V	Amps 208V	240V	NEMA Cap Number 120V	208V	240V	Ship Wt. (lbs)
2-HF (501-2)	2	32"	2000	16.7	9.6	8.3	5-30P	6-15P	6-15P	300
3-HF (501-3)	3	46"	3000	25.0	14.4	12.5	5-50P	6-20P	6-20P	310
4-HF (501-4)	4	60"	4000	33.3	19.2	16.7	5-50P	6-30P	6-30P	335
5-HF (501-5)	5	74"	5000	N/A	24.0	20.8	N/A	6-30P	6-30P	375
6-HF (501-6)	6	88"	6000	N/A	28.8	25.0	N/A	6-50P	6-50P	400

Spacing between wells is 2". Floor clearance of unit is 6-1/4". Clearance height of open under storage is 17-3/4". Open under storage widths are 22-3/16", 36-3/16",50-3/16", 64-3/16", and 78-3/16".

DIMENSION ADDITIONS FOR OPTIONS

- Add 23-3/4" to height for buffet protector guard
- Add 14" to height for cafeteria protector guard
- Add 22-3/4" to height for double display shelf
- Add 8" to width for cutting board
- Add 12-3/4" to width for solid ribbed tray slide
- Add 12-1/2" to width for 3-bar tray slide

Note: Line-up drawing required when ordering false front, cashier stand or interconnected units.

	Part #	Description
❑	PPC	PIZZAZZ POWDER COATING
❑	SCB	8" stainless steel cutting board, flush with top
❑	MCB	8" maple cutting board, flush with top
❑	SRTS	Solid 3-ribbed tray slide, 16-gauge stainless steel
❑	3BTS	3-bar tray slide
❑	MBS	18" maple end bread shelf; left, right - flush with top
❑	SBS	18" stainless steel end bread shelf; left, right - flush with top
❑	HD	Hinged doors with solid bottom
❑	SD	Sliding doors with solid bottom
❑	CPG	Cafeteria protector guard (no heat or lights)
❑	CPGL	Cafeteria protector guard with incandescent lights
❑	CPGFL	Cafeteria protector guard with fluorescent lights
❑	CEG	Cafeteria end guards, right or left
❑	INT	Intermediate shelf
❑	FPB	Full perimeter bumper

	Part #	Description
❑	BPG1	Buffet single side protector guard (no heat or lights)
❑	BPG1IL	Buffet single side protector guard with incandescent lights
❑	BPG1FL	Buffet single side protector guard with fluorescentlights
❑	BEG	Buffet end guards, right or left
❑	BDD	Buffet double display two-sided protector guard
❑	BPGC	Classic protector guards
❑	CPGC	Cafeteria Style Classic Single protector guard
❑	BPG1C	Buffet Style Classic Single Sided protector guard
❑	SCPGC	Cafeteria Style Classic Single protector guards
❑	SSL	Legs in lieu of casters
❑	DOUT	Duplex outlet (120V, 15 AMP)
❑	FRMA	Formica laminate finish
❑	FLP	Filler Strips
❑	FF	Fill Faucet
❑	SKR	Skirting

A-1 SPEC

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- [ ] RESUBMIT WITH CORRECTIONS

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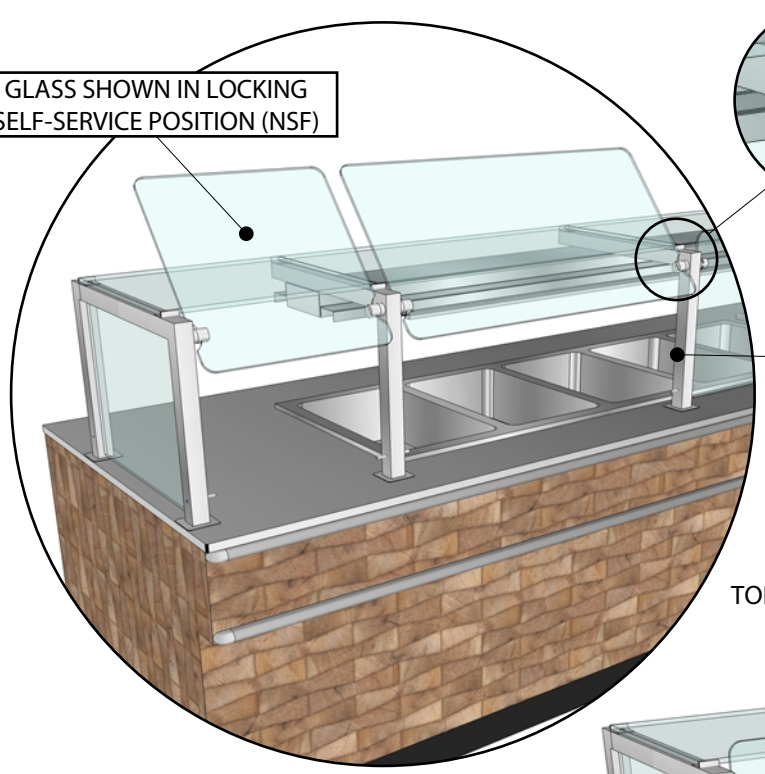
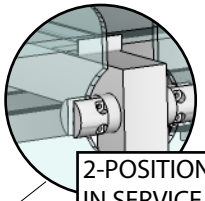
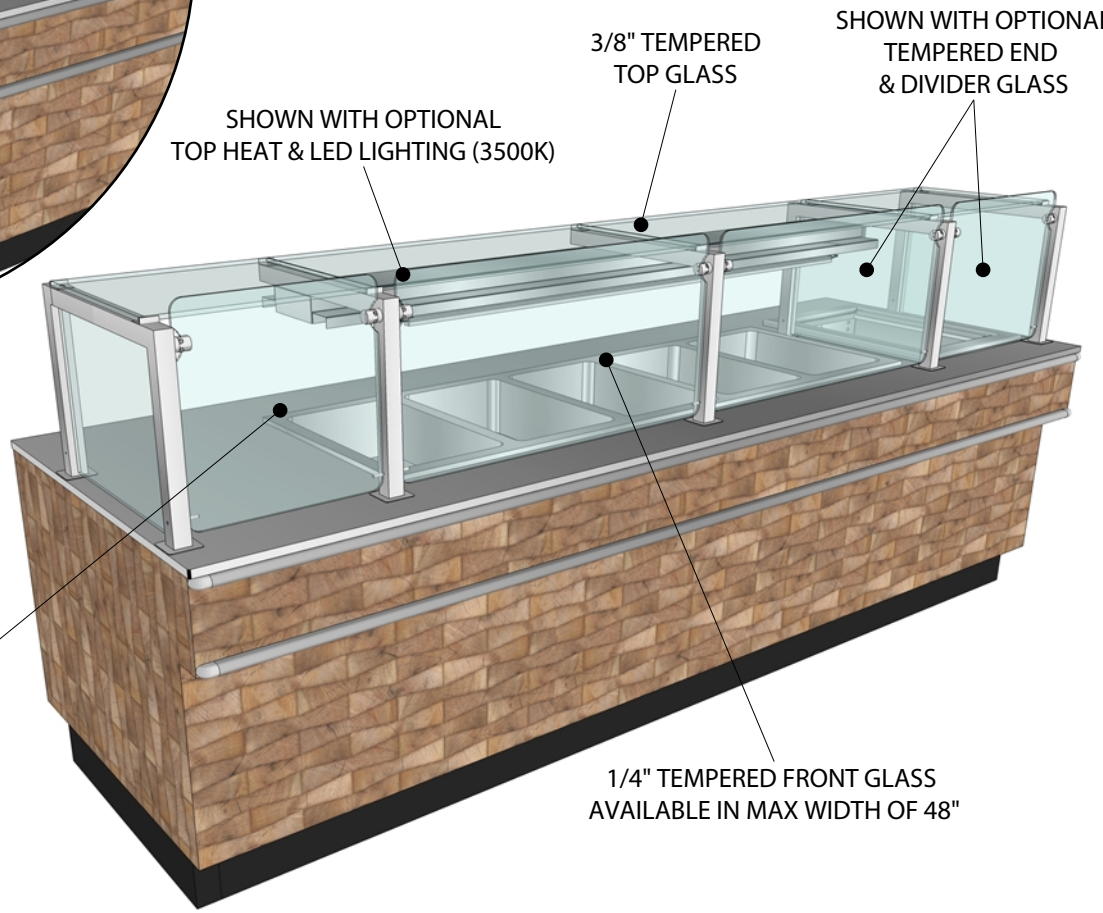




CONSTRUCTED OF 1-1/2" SQUARE TUBING
(BRUSHED STAINLESS STEEL OR POWDER COATED FINISH)



CONVERTIBLE GUARD SHOWN ON PIPER INLINE HOT/COLD BAR

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS	
1	NTE 3/7/2018

Drawn By:NTE

Date: 1-31-2018

Sheet No.
1 of 5

Project #
45700-01

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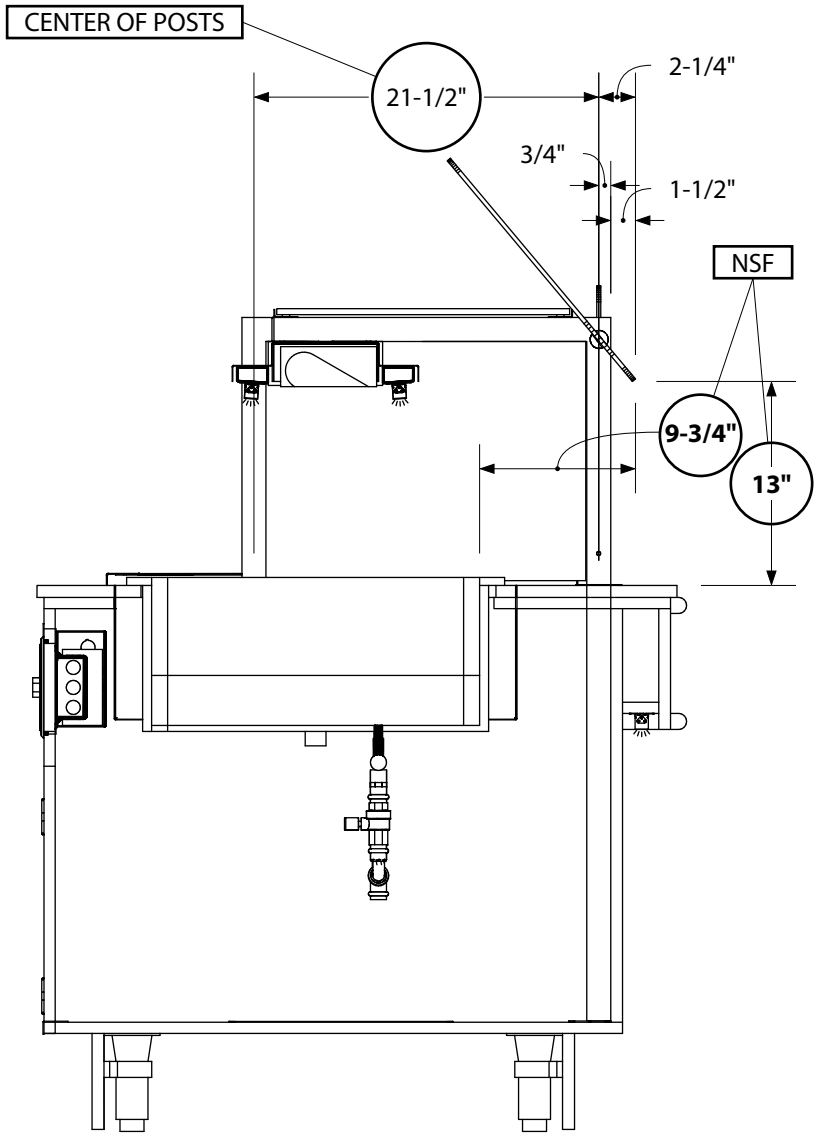
TYPICAL ALIGNMENT OF FOOD PAN IN REFERENCE TO SELF-SERVICE GLASS (NSF)



1 Section View - NSF

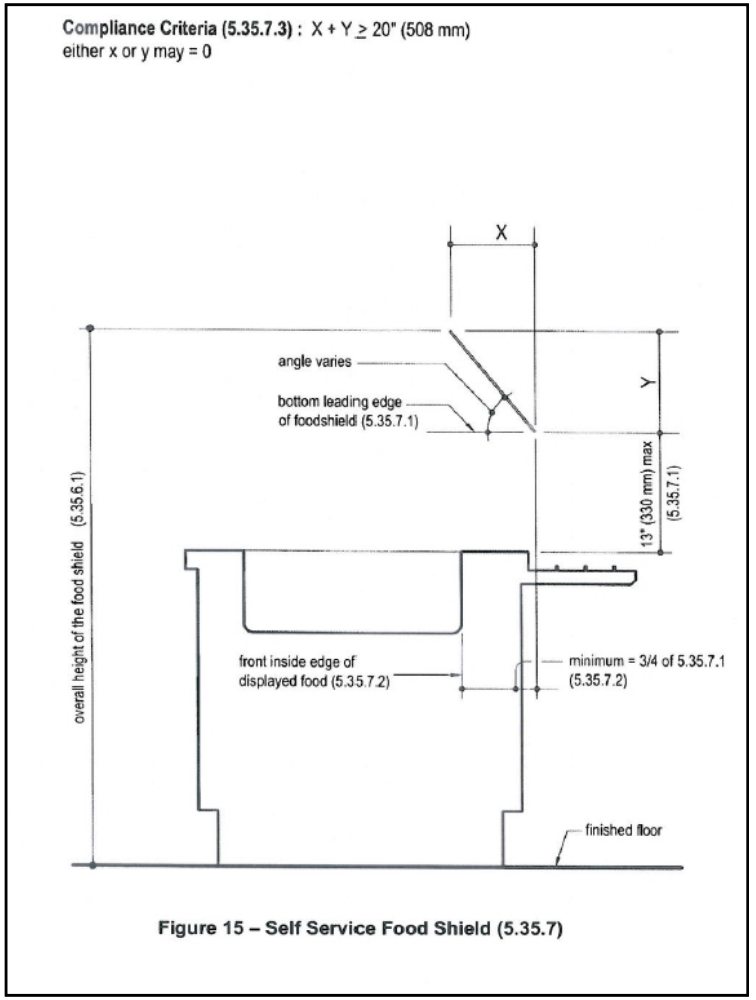


Figure 15 – Self Service Food Shield (5.35.7)

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS

1	NTE 3/7/2018

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2 of 5

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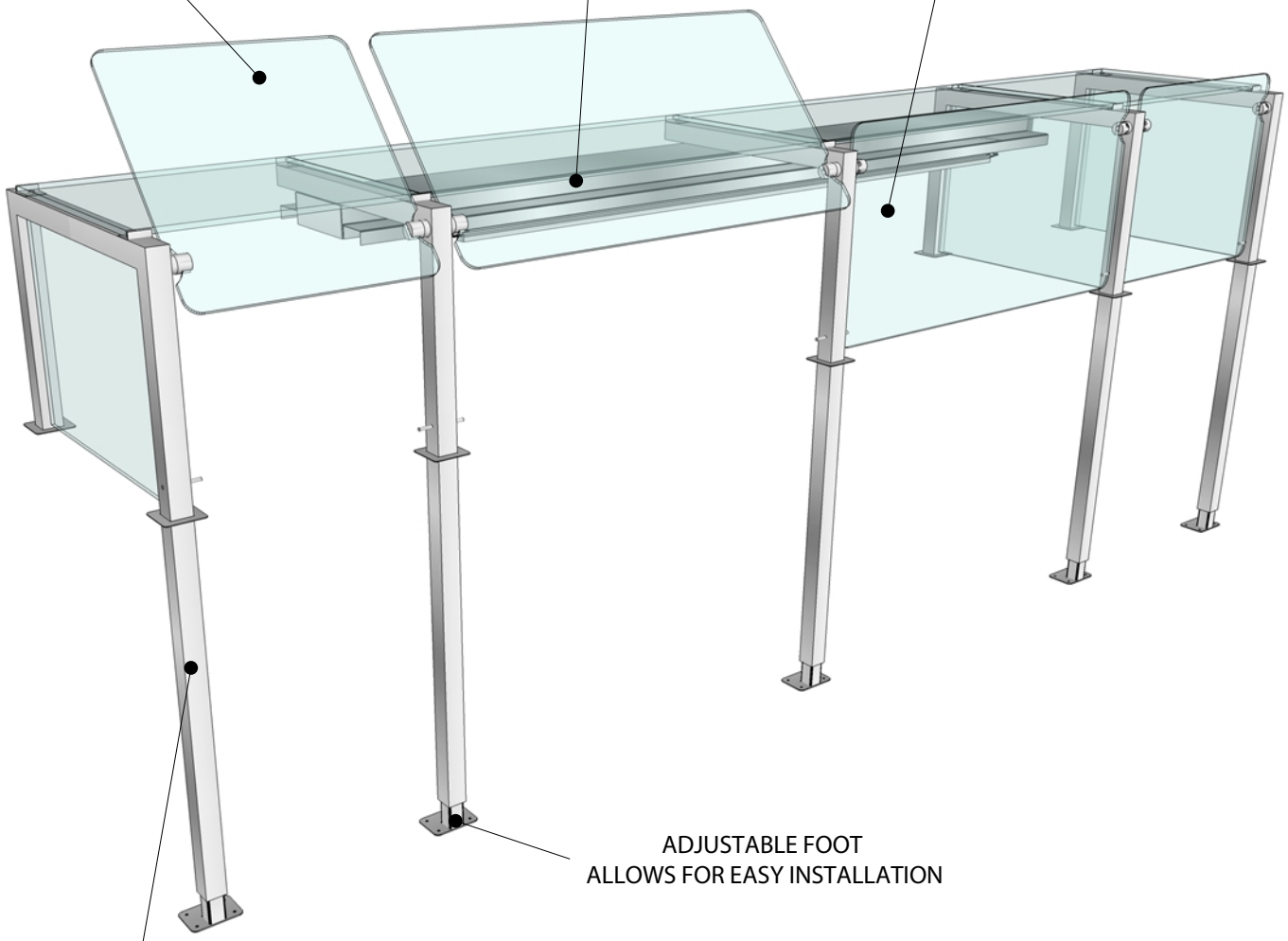
AVAILABLE IN OVERHEAD LED LIGHTING
OR OVERHEAD HEAT WITH LED LIGHTING
BOTH WITH STAINLESS STEEL SHROUD

GLASS SHOWN IN SELF-SERVICE POSITION

GLASS SHOWN IN SERVICE POSITION



ADJUSTABLE FOOT
ALLOWS FOR EASY INSTALLATION

FRONT SQUARE TUBING EXTENDS THROUGH COUNTERTOP
FOR ADDED STRENGTH AND INCREASED SPAN
(OPTIONAL SHORTER FRONT POSTS FOR SHORTER SPANS)

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS	
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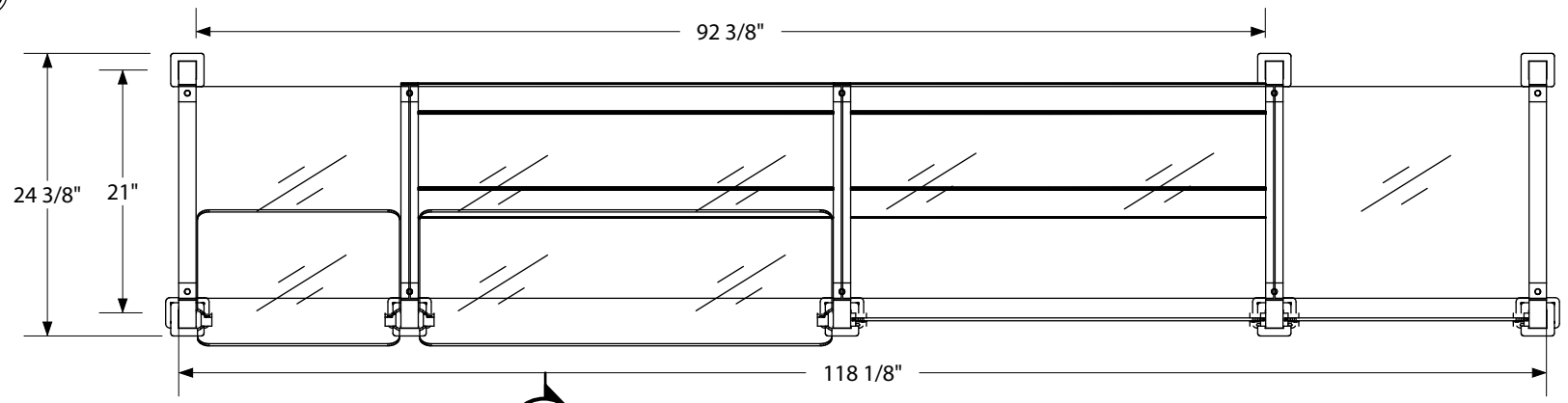
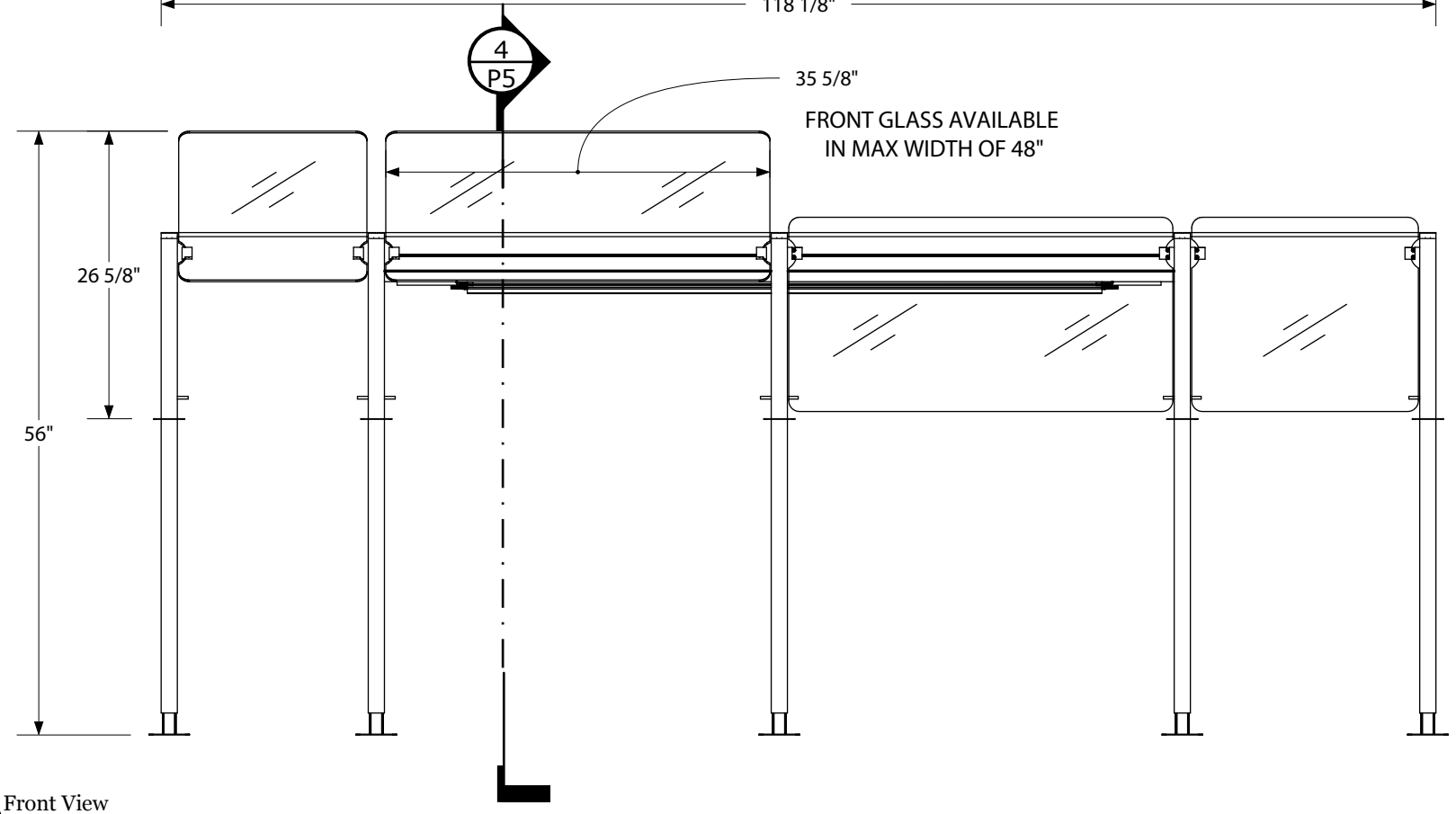
2 Plan View





3 Front View

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

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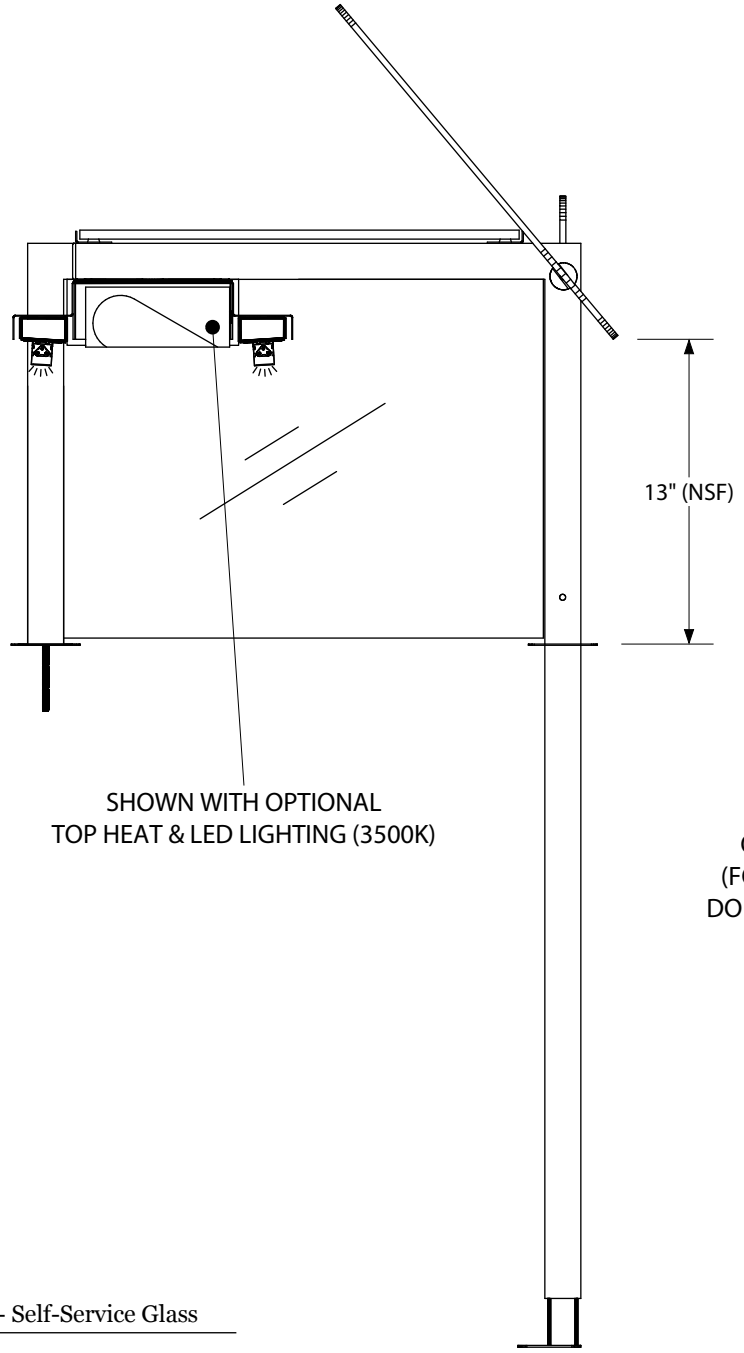

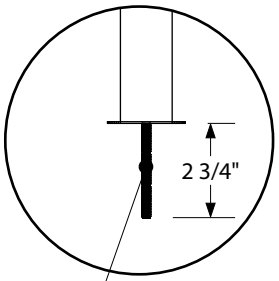

OPTIONAL BOLTED FRONT POST
(FOR SMALLER APPLICATIONS THAT
DO NOT REQUIRE A LARGE REAR SPAN)

4 Section View - Self-Service Glass

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Sheet No.
5 of 5

Project #
45700-01

PIPER ELITE 500

Cashier Stand

The Elite 500 Cashier Stand is a comfortable workstation. Ideal for use in cafeteria/buffet lines. This Elite 500 unit is compatible and will interlock with other Elite 500 units or the cashier stand can be operated as a freestanding separate unit.

STANDARD FEATURES

- 14-gauge stainless steel top with 1-1/2" turndown on all sides
- Top secured by four recessed bolts for easy access
- 14-gauge stainless steel legs fastened to 18-gauge stainless steel bottom shelf
- 20-gauge stainless steel end and front panels are attached to legs
- Standard unit comes with a solid bottom
- Hole in top with bushing for cash register cord **(standard)**
- Locking drawer **(standard)**
- 5" diameter swivel plate casters, 2 with brakes
- Interlocking mechanism is provided to interlock with other Elite units
- The utility drawer is centered in the panel on the open side and mounted on roller bearing slides

JOB_____ ITEM # _____ QTY # _____

MODEL NUMBER

❑ 2-CD
- with drawer

❑ 2-CR
- corner unit

❑ 2-MCU
- mitered corner unit

Consult factory for unit specification on a corner or mitered unit.

DIMENSIONS

- 2-CD - with drawer - 36"H x 28"D x 30"L
- 2-CR - corner unit - 36"H x 28"D x 28"L
- 36" height on all standard units
- 30" height is available on Petite Elite units
- 28" width
- 30" length

COMMON OPTIONS

❑ **PIZZAZZ POWDER COATING IN LIEU OF STAINLESS STEEL**
❑ Tray slides
❑ Tubular foot rest
❑ Duplex outlet
❑ See reverse side for additional options

WARRANTY

One year parts and labor. Warranty is detailed on inside front cover of the price list.

SPEC A-11

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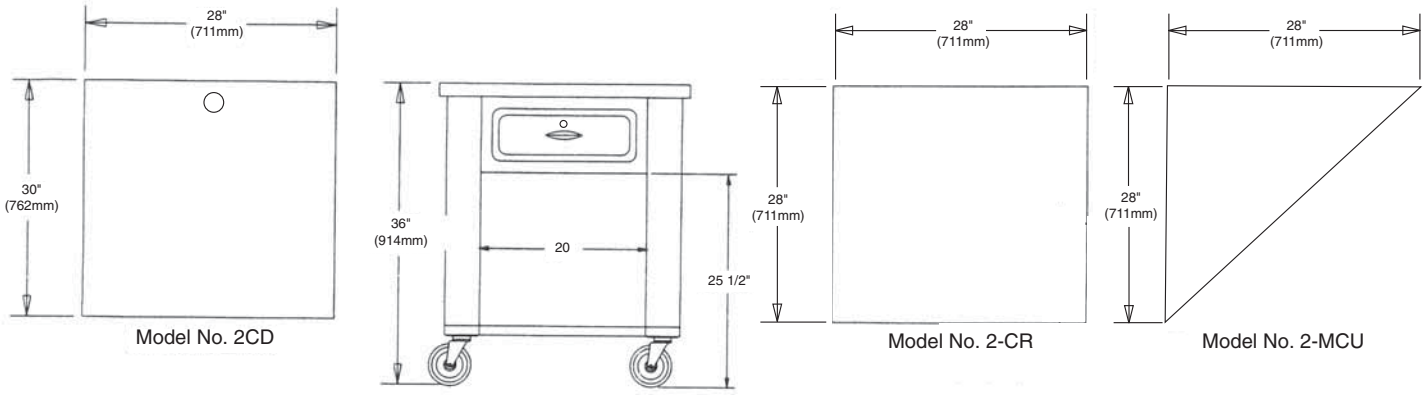
PIPER ELITE 500

Cashier Stand



OPTIONS / ACCESSORIES

	Part #	Description
❑	**PPC**	**Pizzazz Powder Coating**
❑	SRTS	Solid 3-ribbed tray slide, 16-gauge stainless steel
❑	3BTS	3-bar tray slide
❑	SSL	Legs in lieu of casters
❑	DOUT	Duplex outlet (120V, 15 AMP)
❑	FRMA	Formica laminate finish
❑	TFR	Tubular foot rest
❑	SKR	Skirting

CASHIER STAND UNIT SPECIFICATIONS

Model#	Length	Width	Height	Ship Wt. (lbs)
2-CD with drawer	30"	28"	36"	165
2-CR Corner unit	28"	28"	36"	160
Mitered Corner unit	–	28"	36"	140

Drawer is 16" wide, 19" long and 2-1/2" deep.

DIMENSION ADDITIONS FOR OPTIONS

- Add 12-3/4" to width for solid ribbed tray slide
- Add 12-1/2" to width for 3-bar tray slide
- 30" height is available on Petite Elite units

Note: Line-up drawing required when ordering a cashier stand or interconnected units.

A-11 SPEC

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EAGLE GROUP®
Profit from the Eagle Advantage®

Specification Sheet

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Hand Sinks* with Towel and/or Soap Dispenser

MODELS:
- ❑ ***HSA-10-FDP***
- ❑ ***HSA-10-FDPS***
- ❑ ***HSA-10-FLDP***
- ❑ ***HSA-10-FODP***
- ❑ ***HSA-10-FWLDP-LRS***

Short Form Specifications

Eagle Hand Sink, model HSA-10-FDP. Constructed of type 304 stainless steel, all-welded with deep-drawn positive drain sink bowl, inverted "V" edge to prevent spillage, drain, paper towel dispenser, soap dispenser and splash mounted gooseneck faucet.

Eagle Hand Sink, model HSA-10-FDPS. Features are the same as #HSA-10-FDP, plus stainless steel sink skirt.

Eagle Hand Sink, model HSA-10-FLDP. Features are the same as #HSA-10-FDP, plus polymer lever drain.

Eagle Hand Sink, model HSA-10-FODP. Features are the same as #HSA-10-FDP, plus polymer lever drain with overflow.

Eagle Hand Sink, model HSA-10-FWLDP-LRS. Features splash mount gooseneck faucet with wrist handles, towel displenser, soap dispenser, polymer lever drain, and end splashes.

#HSA-10-FDP

Design & Construction Features

- Heavy gauge type 304 stainless steel all-welded construction.
- Inverted "V" edge rim retards spillage.
- Backsplash with a 2˝ (51mm) return on a 45° angle.
- ½˝ (13mm) NPS water inlet, 1½˝ (38mm) NPS drain outlet.
- Unique deep-drawn positive-drain bowl assures complete drainage to meet the most stringent health code requirements.
- All-welded towel dispenser features hinged top assembly, sight window to visually inspect towel level, quick-fill soap dispenser, and is designed to accommodate 4˝ x 10˝ (102 x 254mm) C-fold disposable paper towels.
- Comes with mounting bracket to facilitate wall mount installation.

Options / Accessories

- ❑ P-trap
- ❑ Tail piece
- ❑ End splashes
- ❑ Front skirt**
- ❑ Side mount wall bracket
- ❑ MICROGARD® antimicrobial agent***

** Front skirt available only for models HSA-10-FDP and HSA-10-FDPS.
*** For hand sinks #HSA-10-FDP and #HSA-10-FDPS only.

* Non-electric. For hand sinks with electric soap dispenser and faucets, see spec sheet #20.42.
For hand sinks with deck-mounted soap dispensers, see spec sheets #EG20.05 and #EG20.07.

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www.eaglegrp.com

Foodservice Division: Phone 800-441-8440
MHC/Retail Display Divisions: Phone 800-637-5100

Certifications / Approvals

NSF

AUTOQUOTES

KCL

For custom configuration or fabrication needs, contact our **SpecFAB® Division.**
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EG20.41 Rev. 09/14

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

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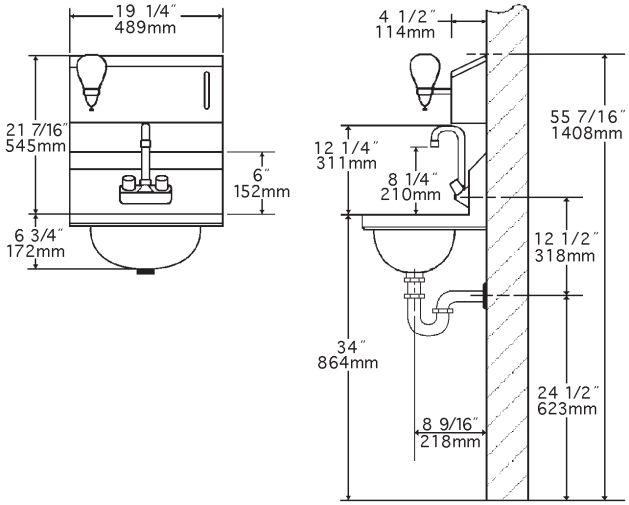
Item No.: _____
Project No.: _____
S.I.S. No.: _____

EG20.41 Catalog Specification Sheet No.

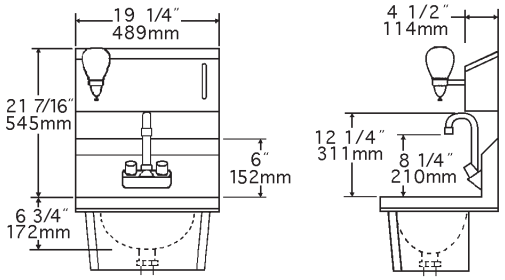
Hand Sinks with Towel and/or Soap Dispenser

Hand Sinks with Towel and/or Soap Dispensers

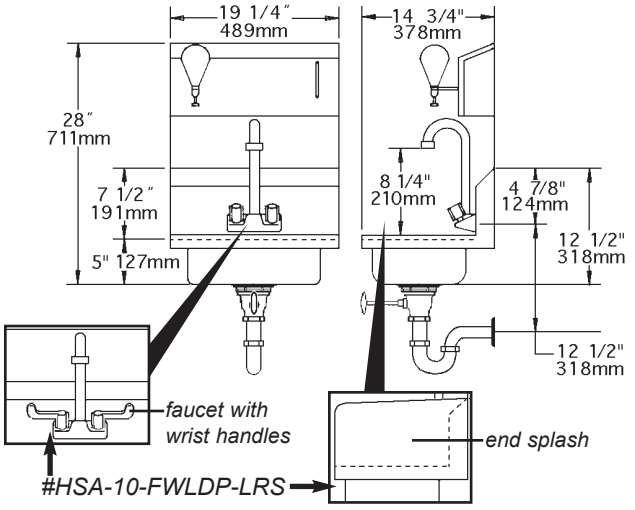
HSA-10-FDP



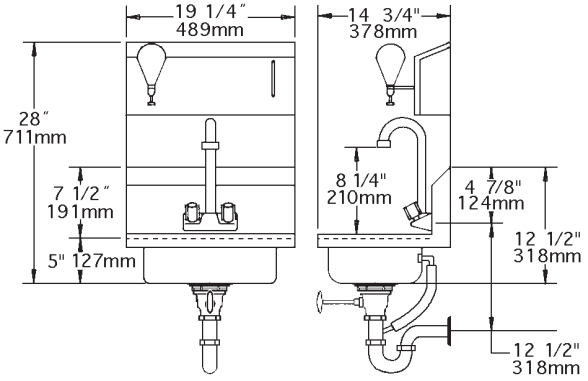
HSA-10-FDPS



HSA-10-FLDP / HSA-10-FWLDP-LRS



HSA-10-FODP



model #	includes towel dispenser, soap dispenser, and…	bowl size width x length x depth in.	bowl size mm	overall size width x length x height in.	overall size mm	weight lbs.	weight kg
HSA-10-FDP	faucet, basket drain	9¾″ x 13½″ x 6¾″	248 x 343 x 173	14¾″ x 19¼″ x 28¼″	376 x 489 x 718	29	13.2
HSA-10-FDPS	faucet, skirt, basket drain	9¾″ x 13½″ x 6¾″	248 x 343 x 173	14¾″ x 19¼″ x 30″	376 x 489 x 762	29	13.2
HSA-10-FLDP	faucet, polymer lever drain	10″ x 14″ x 5″	254 x 256 x 127	14¾″ x 19¼″ x 28″	376 x 489 x 711	32	14.5
HSA-10-FODP	faucet, polymer lever drain w/overflow	10″ x 14″ x 5″	254 x 256 x 127	14¾″ x 19¼″ x 28″	376 x 489 x 711	30	13.6
HSA-10-FWLDP-LRS	faucet w/wrist handles, poly lever drain, end splashes	10″ x 14″ x 5″	254 x 256 x 127	14¾″ x 19¼″ x 28″	376 x 489 x 711	30	13.6

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Rev. 09/14

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Profit from the Eagle Advantage®

Specification Sheet

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Short Form Specifications

Eagle Spec-Master® Three-Compartment Sinks, model _____. Unit constructed of 14 gauge 300 series, 18-8 stainless steel throughout. Sink bowls coved with a full ⅝″ radius, and shall have a 14″ water level. Drainboards, when required, shall be "V" creased for positive drainage. 9½″ high backsplash with 1″ upturn and tile edge. Legs to be 1⅝″ O.D., stainless steel, with stainless steel gussets, stainless steel crossbracing and adjustable stainless steel bullet feet.

3-compartment sink
(faucets not included)

Options / Accessories

- ❑ Lever drain
- ❑ Lever drain with overflow
- ❑ Twist handle drains
- ❑ Overflow hole
- ❑ Sink kits
- ❑ Faucets
- ❑ Polyboard sink covers
- ❑ Stainless steel sink covers
- ❑ Skirted front panel

Assembly:

- Entire assembly is fuse-welded and planished, providing a one-piece seamless sink unit.
- Welded areas are high-speed belt blended to match adjacent surfaces with continuity of satin finish.
- All outside corners of assembly are bullnosed to provide safe, clean edges.
- Water supply is ½″ (13mm) NPS for hot and cold lines.

Spec-Master® FN Series Coved Corner Three-Compartment Sinks

MODELS:

❑ ***FN2048-3-**** ❑ ***FN2472-3-****
❑ ***FN2054-3-**** ❑ ***FN2860-3-****
❑ ***FN2060-3-****

** See table on back for complete model numbers.*

Top:

- Drainboards, backsplash and rolled rims are 14 gauge 300 series stainless steel.
- Drainboards, when provided, are integrally welded.
- All rolled edges are highlighted for enhanced appearance.
- 9½″ high backsplash with 1″ upturn and tile edge.
- 1⅛″ (29mm) faucet holes* punched on 8″ (203mm) centers.

Base:

- Legs: 1⅝″ (41mm)-diameter stainless steel tubing with stainless steel gussets and fully adjustable stainless steel bullet feet.
- Crossbracing: Adjustable, 1¼″ (32mm)-diameter stainless steel; running left-to-right and front-to-back.
- Leg locations fall directly under sink bowls**, providing increased stability and maximum weight support.
- Leg gussets welded to a die-cut heavy-gauge stainless steel reinforcing corner plate.
- Legs are crossbraced on all sides for increased stability.

Sink Bowls:

- 14 gauge 300 series stainless steel.
- 14″ (356mm) water level, 17″ (432mm) flood level.
- Sink compartments are coved on a full ⅝″ (41mm) radius and constructed using state-of-the-art seamless welding techniques.
- Basket-type waste drain fits sink bowls' 3½″ (89mm) opening and features 1½″ (38mm) outlet.

* Three-compartment sinks with 20″ x 16″ (508 x 406mm) bowls have one set of faucet holes. All others feature two sets of faucet holes.

** On sinks with drainboard(s) 30″ or longer, legs are located underneath the outer end of drainboard(s).

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EG20.34 Rev. 02/18

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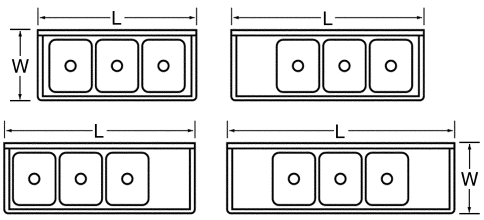
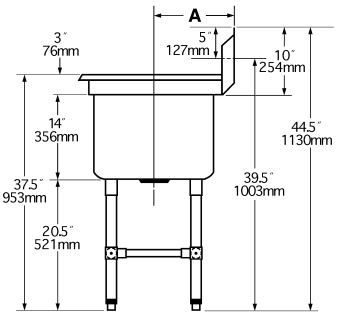
Item No.: _____
Project No.: _____
S.I.S. No.: _____

Spec-Master® FN Series Coved Corner Three-Compartment Sinks



Drain location for rough-in

bowl width in.	bowl width mm	bowl length in.	bowl length mm	Dimension A	
20″	508	16″	406	14″	356
20″	508	18″	457	14″	356
20″	508	20″	508	14″	356
24″	610	24″	610	16″	406
28″	711	20″	508	18″	457



model #	BOWL DIMENSIONS width in.	width mm	length in.	length mm	DRAINBOARD quantity	length in.	length mm	OVERALL DIMENSIONS width in.	width mm	length in.	length mm	weight lbs.	weight kg
FN2048-3-14/3	20″	508	16″	406	0	-		27″	686	57″	1448	99	44.9
FN2048-3-18R or ***L-14/3***	20″	508	16″	406	1	18″	457	27″	686	73½″	1867	118	53.5
FN2048-3-18-14/3	20″	508	16″	406	2	18″	457	27″	686	90″	2286	137	61.7
FN2048-3-24R or ***L-14/3***	20″	508	16″	406	1	24″	610	27″	686	79½″	2019	124	56.2
FN2048-3-24-14/3	20″	508	16″	406	2	24″	610	27″	686	102″	2591	149	67.6
FN2048-3-30R or ***L-14/3***	20″	508	16″	406	1	30″	762	27″	686	85½″	2172	129	58.5
FN2048-3-30-14/3	20″	508	16″	406	2	30″	762	27″	686	114″	2896	159	72.1
FN2048-3-36R or ***L-14/3***	20″	508	16″	406	1	36″	914	27″	686	91½″	2324	134	60.8
FN2048-3-36-14/3	20″	508	16″	406	2	36″	914	27″	686	126″	3200	169	76.7
FN2054-3-14/3 *	20″	508	18″	457	0	-		27″	686	63″	1600	102	46.3
FN2054-3-18R or ***L-14/3 ****	20″	508	18″	457	1	18″	457	27″	686	79½″	2019	121	54.9
FN2054-3-18-14/3 *	20″	508	18″	457	2	18″	457	27″	686	96″	2438	140	63.5
FN2054-3-24R or ***L-14/3 ****	20″	508	18″	457	1	24″	610	27″	686	85½″	2172	127	57.6
FN2054-3-24-14/3 *	20″	508	18″	457	2	24″	610	27″	686	108″	2743	158	71.6
FN2054-3-30R or ***L-14/3 ****	20″	508	18″	457	1	30″	762	27″	686	91½″	2324	132	59.9
FN2054-3-30-14/3 *	20″	508	18″	457	2	30″	762	27″	686	120″	3048	162	73.5
FN2054-3-36R or ***L-14/3 ****	20″	508	18″	457	1	36″	914	27″	686	97½″	2477	137	62.1
FN2054-3-36-14/3 *	20″	508	18″	457	2	36″	914	27″	686	132″	3358	172	78.0
FN2060-3-14/3 *	20″	508	20″	508	0	-		27″	686	69″	1753	114	51.7
FN2060-3-18R or ***L-14/3 ****	20″	508	20″	508	1	18″	610	27″	686	85½″	2172	133	60.3
FN2060-3-18-14/3 *	20″	508	20″	508	2	18″	457	27″	686	102″	2591	152	68.9
FN2060-3-24R or ***L-14/3 ****	20″	508	20″	508	1	24″	457	27″	686	91½″	2324	139	63.1
FN2060-3-24-14/3 *	20″	508	20″	508	2	24″	610	27″	686	114″	2896	164	74.4
FN2060-3-30R or ***L-14/3 ****	20″	508	20″	508	1	30″	762	27″	686	97½″	2477	144	65.3
FN2060-3-30-14/3 *	20″	508	20″	508	2	30″	762	27″	686	126″	3200	174	78.9
FN2060-3-36R or ***L-14/3 ****	20″	508	20″	508	1	36″	914	27″	686	103½″	2629	149	67.6
FN2060-3-36-14/3 *	20″	508	20″	508	2	36″	914	27″	686	138″	3505	184	83.5
FN2472-3-14/3 *	24″	610	24″	610	0	-		31″	787	81″	2057	127	57.6
FN2472-3-18R or ***L-14/3 ****	24″	610	24″	610	1	18″	457	31″	787	97½″	2477	146	66.2
FN2472-3-18-14/3 *	24″	610	24″	610	2	18″	457	31″	787	114″	2896	165	74.8
FN2472-3-24R or ***L-14/3 ****	24″	610	24″	610	1	24″	610	31″	787	103½″	2629	152	68.9
FN2472-3-24-14/3 *	24″	610	24″	610	2	24″	610	31″	787	126″	3200	177	80.3
FN2472-3-30R or ***L-14/3 ****	24″	610	24″	610	1	30″	762	31″	787	109½″	2769	157	71.2
FN2472-3-30-14/3 *	24″	610	24″	610	2	30″	762	31″	787	138″	3505	187	84.8
FN2472-3-36R or ***L-14/3 ****	24″	610	24″	610	1	36″	914	31″	787	115½″	2934	162	73.5
FN2472-3-36-14/3 *	24″	610	24″	610	2	36″	914	31″	787	150″	3810	197	89.4
FN2860-3-14/3 *	28″	711	20″	508	0	-		35″	889	69″	1753	130	59.0
FN2860-3-18R or ***L-14/3 ****	28″	711	20″	508	1	18″	457	35″	889	85½″	2172	149	67.6
FN2860-3-18-14/3 *	28″	711	20″	508	2	18″	457	35″	889	102″	2591	168	76.2
FN2860-3-24R or ***L-14/3 ****	28″	711	20″	508	1	24″	610	35″	889	91½″	2324	155	70.3
FN2860-3-24-14/3 *	28″	711	20″	508	2	24″	610	35″	889	114″	2896	180	81.6
FN2860-3-30R or ***L-14/3 ****	28″	711	20″	508	1	30″	762	35″	889	97½″	2477	160	72.6
FN2860-3-30-14/3 *	28″	711	20″	508	2	30″	762	35″	889	126″	3200	190	86.2
FN2860-3-36R or ***L-14/3 ****	28″	711	20″	508	1	36″	914	35″	889	103½″	2629	165	74.8
FN2860-3-36-14/3 *	28″	711	20″	508	2	36″	914	35″	889	138″	3505	200	90.7

* Features two sets of faucet holes.

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Profit from the Eagle Advantage®

Specification Sheet

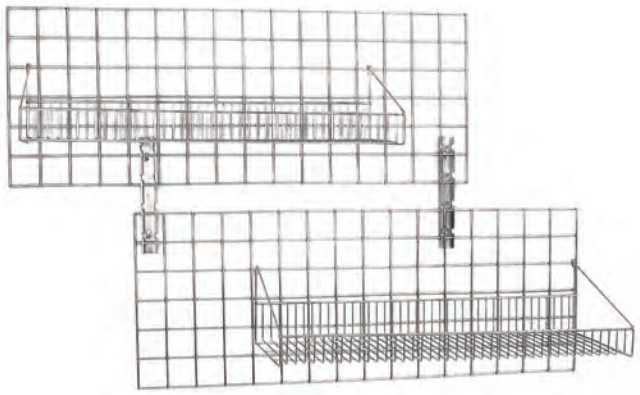
Item No.: _____
Project No.: _____
S.I.S. No.: _____

Wall Grid Shelving for Walstor® Modular Wall System

MODELS:

❑ *1430WGS-C*	❑ *1430WGS-VG*	❑ *1430WGS-Z*
❑ *1436WGS-C*	❑ *1436WGS-VG*	❑ *1436WGS-Z*
❑ *1830WGS-C*	❑ *1830WGS-VG*	❑ *1830WGS-Z*
❑ *1836WGS-C*	❑ *1836WGS-VG*	❑ *1836WGS-Z*
❑ *1848WGS-C*	❑ *1848WGS-VG*	❑ *1848WGS-Z*

See spec sheet #**EG02.00A** for Wall Modular Wall System.
See spec sheet #**EG02.00B** for Walstor® accessories.



wall grid shelves shown attached to Walstor® wall mats

Design and Construction Features

- Provides convenient wire shelving that hooks anywhere onto wall mat of Walstor® Wall System, without fasteners.
- Features built-in 2¾″ (70mm)-high front ledge and 3⅞″ (98mm)-high rear upturn.
- Shelf and brackets welded into one piece.
- Comes in widths of 14″ or 18″ (356 or 457mm), and lengths of 30″, 36″, or 48″ (762, 914, or 1219mm).
- Offered with chrome, Valu-Gard® green epoxy, or EAGLEbrite® zinc finish.

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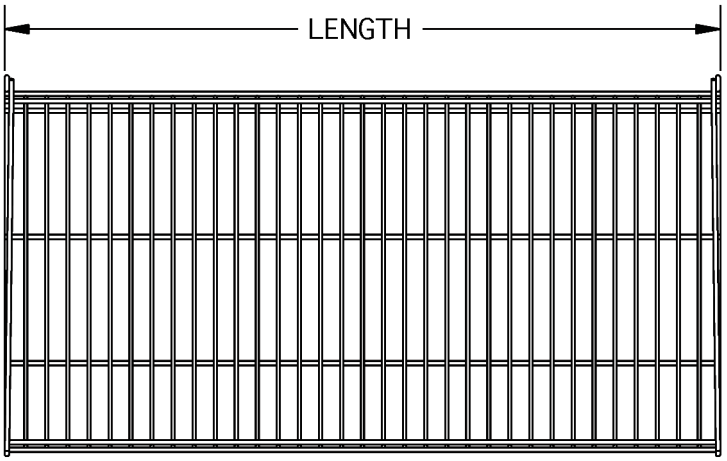
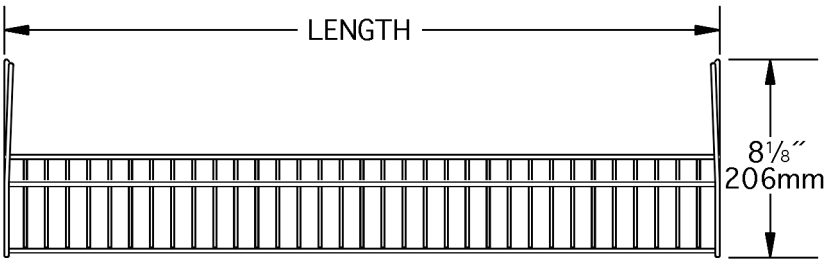
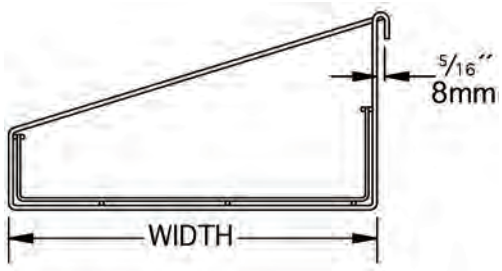
Wall Grid Shelving for Walstor® Modular Wall System



TOP VIEW



FRONT VIEW



SIDE VIEW

CHROME model #	VALU-GARD® model #	EAGLEBRITE® model #	width in.	width mm	length in.	length mm	weight lbs.	weight kg
1430WGS-C	*1430WGS-VG*	*1430WGS-Z*	14″	356	30″	762	7	3.2
1436WGS-C	*1436WGS-VG*	*1436WGS-Z*	14″	356	36″	914	9	4.1
1830WGS-C	*1830WGS-VG*	*1830WGS-Z*	18″	457	30″	762	9	4.1
1836WGS-C	*1836WGS-VG*	*1836WGS-Z*	18″	457	36″	914	12	5.4
1848WGS-C	*1848WGS-VG*	*1848WGS-Z*	18″	457	48″	1219	15	6.8

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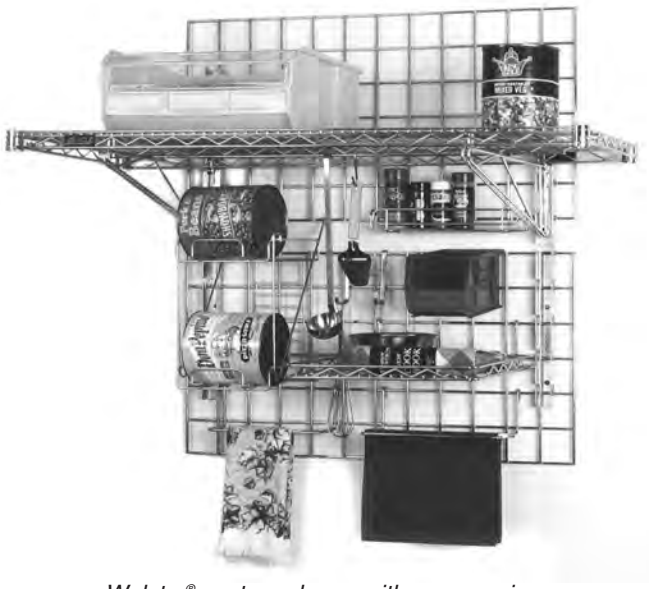


Walstor® system shown with accessories

Walstor® Modular Wall System Accessories

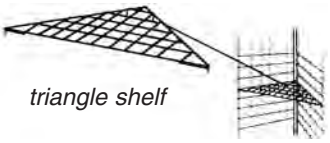
MODELS:

- ❑ ***PH3RD***
- ❑ ***BH-1***
- ❑ ***DSS***
- ❑ ***DB***
- ❑ ***GS17***
- ❑ ***HFH***
- ❑ ***LDH***
- ❑ ***A203879***
- ❑ ***LH***
- ❑ ***LDUS12***
- ❑ ***MDH-4***
- ❑ ***MDH-6***
- ❑ ***MDH-8***
- ❑ ***MDH-10***
- ❑ ***MDH-12***
- ❑ ***A204237***
- ❑ ***PBH***
- ❑ ***A203877***
- ❑ ***SH***
- ❑ ***SR14***
- ❑ ***SR24***
- ❑ ***TR10***
- ❑ ***UH***
- ❑ ***WB***
- ❑ ***CR2D***
- ❑ ***CR4D***
- ❑ ***GPWB***
- ❑ ***GPS24-C***
- ❑ ***GBP15-C***

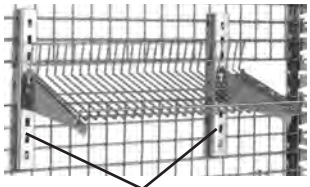
See #**EG02.00A** for Walstor® Modular Wall Systems.
See #**EG02.00C** for Optional Wall Grid Shelving for Walstor®.

grid shelf

light duty utility shelf



triangle shelf



vertical uprights for display shelf

SHELVES model #	description	weight lbs.	weight kg	length x width x height in.	length x width x height mm
GS17	grid shelf	4.0	1.8	16¾″ x 16¾″	426 x 426
LDUS12	light duty utility shelf	2.0	0.9	11¼″ x 8″ x 3½″	286 x 203 x 89
GPS24-C	triangle shelf	3.6	1.6	24″ x 24″	610 x 610
MISCELLANEOUS					
DSS	vertical uprights	2.0	0.9	2″ x 8¾″	305 x 222
GPWB	wall bracket	0.2	0.1	3″ x 4″ x 4″	76 x 102 x 102

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Item No.: _____
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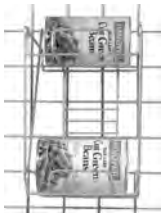
Walstor® Modular Wall System Accessories


large double hook


large snap hook


merchandising display hook


rack


can rack (2-deck)


one-third size pan holder


book holder


hanging file holder


large bin


drop basket

HOOKS AND BRACKETS *		weight		length x width x height	
model #	description	lbs.	kg	in.	mm
LDH	large double hook	0.3	0.1	2¼″ x 4¼″ x ⅜″	57 x 108 x 3
LH	large snap hook	0.3	0.1	2¼″ x 4¼″ x ⅜″	57 x 108 x 3
MDH-4	merchandise display hook	0.2	0.1	4″ x 3″	102 x 76
MDH-6	merchandise display hook	0.2	0.1	6″ x 3″	152 x 76
MDH-8	merchandise display hook	0.2	0.1	8″ x 3″	203 x 76
MDH-10	merchandise display hook	0.2	0.1	10″ x 3″	254 x 76
MDH-12	merchandise display hook	0.2	0.1	12″ x 3″	305 x 76
SH	small snap hook	0.3	0.1	1¼″ x 4¼″ x ⅜″	32 x 108 x 3
UH	utensil hook	0.3	0.1	2½″ x 2″	64 x 51
RACKS					
SR14	rack	1.0	0.5	14″ x 2″	356 x 51
SR24	rack	1.5	0.7	24″ x 2″	610 x 51
TR10	towel rack	1.0	0.5	10½″ x 5″ x 3½″	267 x 127 x 89
CR2D	2-deck can rack	1.0	0.5	8⅝″ x 13″ x 14″	219 x 330 x 356
CR4D	4-deck can rack	3.0	1.3	8¼″ x 8½″ x 28½″	210 x 216 x 724
HOLDERS					
PH3RD	one-third size pan holder	1.0	0.5	12″ x 8″ x 3″	305 x 203 x 76
BH-1	book holder	2.0	0.9	3″ x 12″ x 10″	76 x 305 x 254
HFH	hanging file holder	1.0	0.5	12″ x 8″ x 3″	305 x 203 x 76
PBH	plastic bin holder	0.3	0.1	4″ x 2″	102 x 51
BINS AND BIN ACCESSORIES					
A203877 **	small plastic bin	1.0	0.5	10⅞″ x 5½″ x 5″	276 x 140 x 89
A203879 **	large plastic bin	1.0	0.5	10⅞″ x 11″ x 5″	276 x 280 x 89
A204237	plastic bin dividers	2.0	0.9	10⅞″ x 5″	276 x 89
BASKETS					
DB	drop basket (for 18″ wire shelf)	3.0	1.4	22″ x 18″ x 11″	559 x 457 x 280
WB	wire basket	0.5	0.2	13⅜″ x 5″ x 7″	340 x 127 x 178
GBP15-C	grid panel basket	2.8	1.2	15″ x 24″	381 x 610

* All hooks are heavy gauge chrome-plated mild steel.
** #A203877 and #A203879 bins require #PBH plastic bin holder.

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We put space to work.

Item # _____

Job _____

MetroMax® Q Polymer/Wire Shelving Starter and Add-on Units.

Quick-to-adjust, corrosion resistant shelving constructed of removable polymer open grid shelf mats, wire shelf frames, and corner releases. Shelf frames have an epoxy coating over an electroplated substrate and lift-off plastic shelf mats. Shelves offer a 20 year warranty against corrosion. Rust proof polymer posts offer a lifetime warranty against corrosion. Shelf mats and posts have built-in Microban® antimicrobial product protection. Rigid four-sided shelf frame and welded corners provide complete 360° capture of the wedge and post to ensure stability, strength and structural integrity. Each Starter and Add-on unit has a maximum capacity of 2,000 lbs. (907kg) evenly distributed. Units assemble easily — Shelves mount on four one-piece wedges along grooved, numbered posts. Shelves adjust on 1" (25mm) increments.

Four Shelf Starter Unit

- **Starter units:** shelves and polymer posts under one easy to order model number.
- **Add-on units:** include (2) polymer posts, open grid mat shelves, and S-hooks to connect a unit end-to-end under one easy to order model number.
- **Corner (Right Angle) units:** allow easy access to the shelf contents by eliminating a front post. They are configured using a starter unit, an add-on unit and intermediate "S" hook brackets.
- **Forever Strong:** Proven corner connection and four-sided shelf frame with center truss(es) assures stability and strength in stationary, mobile, and high-density track shelving configurations. 800 lbs. (363kg) per shelf for lengths of 24" to 48" (610 to 1219mm) 600 lbs. (272kg) per shelf for lengths of 54" (1372mm) or longer Stationary unit: 2000lbs (907kg) evenly distributed.
- **Life-Long Rust Resistant:** Shelves offer a 20 year warranty against rust and corrosion. Polymer posts are rust-proof.
- **Easy to Clean and Maintain:** Polymer mats can be easily removed and cleaned in a sink or commercial washer / dish machine.
- **Microban® Antimicrobial Product Protection:** is built into the shelf mats and posts to inhibit the growth of bacteria, mold, mildew, and fungus that cause odors and product degradation. Microban product protection keeps the product "cleaner between cleanings".
- **Quick-to-Adjust:** Patented corner release allows shelves to be adjusted without tools. Simply flip each corner release, relocate the wedge connectors on the posts, and reposition the shelf. Quickly adjust shelves to reclaim wasted vertical space.
- **Efficient Use of Space:** Shelves adjust on 1" (25mm) increments along the post to maximize the use of available vertical space.
- **Fast, Easy Assembly:** Shelves are ready to use right out of the box. One-piece wedges securely attach to the posts – Raised beads on the back of each wedge snap into the grooves on the post. Window on wedge aligns with numbers on the post to locate the desired shelf position. Shelf seats into position over the posts and wedges. A unit can be assembled without tools in minutes.
- **Open Grid (vented) Shelf mats:** Sectioned and promote air circulation and light penetration. Built-in ship's edge helps contain supplies.
- **NSF Listed for all environments.**
- **Maximum Versatility:** Complete line of accessories are found on spec sheet 9.25.

Starter Unit ***Add-on Unit***

Supports good HACCP processes

MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban® Products Company, Huntersville, NC. Microban® product protection does not by itself protect a user from food borne illness. Product must be routinely cleaned.

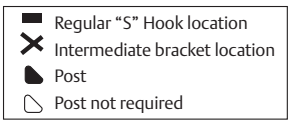
L02-202 Printed in U.S.A. 3/20

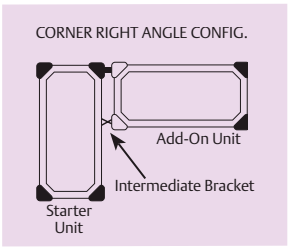
InterMetro Industries Corporation
North Washington Street, Wilkes-Barre, PA 18705
Product Information. U.S. and Canada: 1.800.992.1776
Outside U.S. and Canada: www.metro.com/contactus

MetroMax® Q Starter & Add-on Units

Material Specifications:

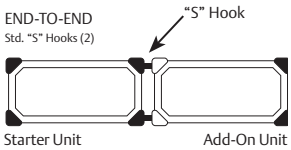
- Shelf Mats: Injection-molded polypropylene with exclusive built-in Microban® antimicrobial product protection.
- Shelf frames and epoxy-coated posts: Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. The adjustable foot is reinforced nylon.
- Polymer Post: Pultrusions — continuous glass fibers and thermoset resin composite with built-in Microban® antimicrobial product protection.
- Shelf Wedge Connector: Reinforced nylon.
- Temperature range: -20°F (-29°C) to 125°F (52°C) continuous use, with intermittent exposure to 200°F (93°C) for cleaning.
- Visit metro.com/service-support for cleaning guidelines.





Starter Units: consist of four or five open grid shelves and four posts.

Add-on Units: consist of four or five shelves, (2) posts, and standard S-Hook Kits (2 per shelf) to configure end-to-end units.
Four tier units include (8) standard "S" Hooks. (model number, M9995)
Five tier units include (10) standard "S" Hooks. (model number, M9995)



Corner (Right Angle) Configurations: select one add-on unit and intermediate "S" Hook brackets.

5-Shelf Unit with 74" polymer posts

Starter Units

Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Starter Unit
18x24	457x610	39.8	18.1	5Q317G3
18x30	457x760	48.8	22.1	5Q327G3
18x36	457x914	57.3	26.0	5Q337G3
18x42	457x1060	65.8	29.8	5Q347G3
18x48	457x1219	74.8	33.9	5Q357G3
18x54	457x1372			
18x60	457x1524	92.3	41.9	5Q367G3
18x72	457x1829	108.8	49.4	5Q377G3
21x24	530x610	48.8	22.1	5Q417G3
21x30	530x760	57.3	26.0	5Q427G3
21x36	530x914	65.8	29.8	5Q437G3
21x42	530x1060	72.8	33.0	5Q447G3
21x48	530x1219	81.3	36.9	5Q457G3
21x54	530x1372			
21x60	530x1524	101.3	45.9	5Q467G3
21x72	530x1829	117.3	53.2	5Q477G3
24x24	610x610	57.3	26.0	5Q517G3
24x30	610x760	65.8	29.8	5Q527G3
24x36	610x914	74.3	33.7	5Q537G3
24x42	610x1060	79.3	36.0	5Q547G3
24x48	610x1219	87.8	39.8	5Q557G3
24x54	610x1372			
24x60	610x1524	110.3	50.0	5Q567G3
24x72	610x1829	126.3	57.3	5Q577G3

Add-On Units

Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Add-On Unit
18x24	457x610	37.4	17.0	5AQ317G3
18x30	457x760	46.4	21.0	5AQ327G3
18x36	457x914	54.9	24.9	5AQ337G3
18x42	457x1060	63.4	28.8	5AQ347G3
18x48	457x1219	72.4	32.8	5AQ357G3
18x54	457x1372			
18x60	457x1524	89.9	40.8	5AQ367G3
18x72	457x1829	106.4	48.3	5AQ377G3
21x24	530x610	46.4	21.0	5AQ417G3
21x30	530x760	54.9	24.9	5AQ427G3
21x36	530x914	63.4	28.8	5AQ437G3
21x42	530x1060	70.4	31.9	5AQ447G3
21x48	530x1219	78.9	35.8	5AQ457G3
21x54	530x1372			
21x60	530x1524	98.9	44.9	5AQ467G3
21x72	530x1829	114.9	52.1	5AQ477G3
24x24	610x610	54.9	24.9	5AQ517G3
24x30	610x760	63.4	28.8	5AQ527G3
24x36	610x914	71.9	32.6	5AQ537G3
24x42	610x1060	76.9	34.9	5AQ547G3
24x48	610x1219	85.4	38.7	5AQ557G3
24x54	610x1372			
24x60	610x1524	107.9	48.9	5AQ567G3
24x72	610x1829	123.9	56.2	5AQ577G3

Actual Dimensions:
Width: Add 3/8" (10mm) to nominal size. Length: Subtract 3/16" (5mm) from nominal size.

74" Five Shelf Starter Unit

Starter & Add-on Unit Together

"S" Hook
Cat. No. **M9995**

Intermediate"S" Hook Kit
Cat. No. **Q9995Z**

Creating a Right Angle (Corner) configuration. Use one standard "S" Hook (included with the Add-on unit) and one Intermediate "S" Hook per tier. Intermediate"S" Hook Bracket Cat. No. Q9995Z

Job _____

MetroMax® Q Starter & Add-on Units

We put space to work.

4-Shelf Unit with 74" polymer posts

Starter Units

Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Starter Unit
18x24	457x610	33.6	15.2	MQ-182474G-S-4
18x30	457x760	40.8	18.5	MQ-183074G-S-4
18x36	457x914	47.6	21.6	MQ-183674G-S-4
18x42	457x1060	54.4	24.7	MQ-184274G-S-4
18x48	457x1219	61.6	27.9	MQ-184874G-S-4
18x54	457x1372	68.8	31.2	MQ-185474G-S-4
18x60	457x1524	75.6	34.3	MQ-186074G-S-4
18x72	457x1829	88.8	40.3	MQ-187274G-S-4
21x24	530x610	40.8	18.5	MQ-212474G-S-4
21x30	530x760	47.6	21.6	MQ-213074G-S-4
21x36	530x914	54.4	24.7	MQ-213674G-S-4
21x42	530x1060	60.0	27.2	MQ-214274G-S-4
21x48	530x1219	66.8	30.3	MQ-214874G-S-4
21x54	530x1372	75.6	34.3	MQ-215474G-S-4
21x60	530x1524	82.8	37.6	MQ-216074G-S-4
21x72	530x1829	95.6	43.4	MQ-217274G-S-4
24x24	610x610	47.6	21.6	MQ-242474G-S-4
24x30	610x760	54.4	24.7	MQ-243074G-S-4
24x36	610x914	61.2	27.8	MQ-243674G-S-4
24x42	610x1060	65.2	29.6	MQ-244274G-S-4
24x48	610x1219	72.0	32.7	MQ-244874G-S-4
24x54	610x1372	82.8	37.6	MQ-245474G-S-4
24x60	610x1524	90.0	40.8	MQ-246074G-S-4
24x72	610x1829	102.8	46.6	MQ-247274G-S-4

Add-On Units

Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Add-On Unit
18x24	457x610	30.8	14.0	MQ-182474G-A-4
18x30	457x760	38.0	17.2	MQ-183074G-A-4
18x36	457x914	44.8	20.3	MQ-183674G-A-4
18x42	457x1060	51.6	23.4	MQ-184274G-A-4
18x48	457x1219	58.8	26.7	MQ-184874G-A-4
18x54	457x1372	66.0	29.9	MQ-185474G-A-4
18x60	457x1524	72.8	33.0	MQ-186074G-A-4
18x72	457x1829	86.0	39.0	MQ-187274G-A-4
21x24	530x610	38.0	17.2	MQ-212474G-A-4
21x30	530x760	44.8	20.3	MQ-213074G-A-4
21x36	530x914	51.6	23.4	MQ-213674G-A-4
21x42	530x1060	57.2	25.9	MQ-214274G-A-4
21x48	530x1219	64.0	29.0	MQ-214874G-A-4
21x54	530x1372	72.8	33.0	MQ-215474G-A-4
21x60	530x1524	80.0	36.3	MQ-216074G-A-4
21x72	530x1829	92.8	42.1	MQ-217274G-A-4
24x24	610x610	44.8	20.3	MQ-242474G-A-4
24x30	610x760	51.6	23.4	MQ-243074G-A-4
24x36	610x914	58.4	26.5	MQ-243674G-A-4
24x42	610x1060	62.4	28.3	MQ-244274G-A-4
24x48	610x1219	69.2	31.4	MQ-244874G-A-4
24x54	610x1372	80.0	36.3	MQ-245474G-A-4
24x60	610x1524	87.2	39.6	MQ-246074G-A-4
24x72	610x1829	95.6	43.4	MQ-247274G-A-4

4-Shelf Starter Unit

4-Shelf Unit with 63" polymer posts

Starter Units

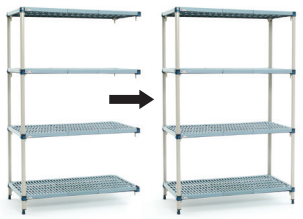
Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Starter Unit
18x24	457x610	32.0	14.5	Q316G3
18x30	457x760	39.2	17.8	Q326G3
18x36	457x914	46.0	20.9	Q336G3
18x42	457x1060	52.8	23.9	Q346G3
18x48	457x1219	60.0	27.2	Q356G3
18x54	457x1372			
18x60	457x1524	74.0	33.6	Q366G3
18x72	457x1829	87.2	39.6	Q376G3
21x24	530x610	39.2	17.8	Q416G3
21x30	530x760	46.0	20.9	Q426G3
21x36	530x914	52.8	23.9	Q436G3
21x42	530x1060	58.4	26.5	Q446G3
21x48	530x1219	65.2	29.6	Q456G3
21x54	530x1372			
21x60	530x1524	81.2	36.8	Q466G3
21x72	530x1829	94.0	42.6	Q476G3
24x24	610x610	46.0	20.9	Q516G3
24x30	610x760	52.8	23.9	Q526G3
24x36	610x914	59.6	27.0	Q536G3
24x42	610x1060	63.6	28.8	Q546G3
24x48	610x1219	70.4	31.9	Q556G3
24x54	610x1372			
24x60	610x1524	88.4	40.1	Q566G3
24x72	610x1829	101.2	45.9	Q576G3

Add-On Units

Nominal Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)	Cat. No. Add-On Unit
18x24	457x610	30.0	13.6	AQ316G3
18x30	457x760	37.2	16.9	AQ326G3
18x36	457x914	44.0	20.0	AQ336G3
18x42	457x1060	50.8	23.0	AQ346G3
18x48	457x1219	58.0	26.3	AQ356G3
18x54	457x1372			
18x60	457x1524	72.0	32.7	AQ366G3
18x72	457x1829	85.2	38.6	AQ376G3
21x24	530x610	37.2	16.9	AQ416G3
21x30	530x760	44.0	20.0	AQ426G3
21x36	530x914	50.8	23.0	AQ436G3
21x42	530x1060	56.4	25.6	AQ446G3
21x48	530x1219	63.2	28.7	AQ456G3
21x54	530x1372			
21x60	530x1524	79.2	35.9	AQ466G3
21x72	530x1829	92.0	41.7	AQ476G3
24x24	610x610	44.0	20.0	AQ516G3
24x30	610x760	50.8	23.0	AQ526G3
24x36	610x914	57.6	26.1	AQ536G3
24x42	610x1060	61.6	27.9	AQ546G3
24x48	610x1219	68.4	31.0	AQ556G3
24x54	610x1372			
24x60	610x1524	86.4	39.2	AQ566G3
24x72	610x1829	99.2	45.0	AQ576G3

4-Shelf Add-On Unit

Includes 8 S-Hooks



Add-on mounts to starter unit via S-Hooks.

Actual Dimensions:
Width: Add 3/8" (10mm) to nominal size. Length: Subtract 3/16" (5mm) from nominal size.

CRES COR®

JOB: _____

ITEM NO: _____

INSULATED STAINLESS STEEL SUPER DUTY HOT CABINET SERIES

FEATURES AND BENEFITS:

- Fully insulated hot cabinet keeps prepared foods at safe serving temperatures.
- Available in Full Size, 3/4 Size or half size units with locking universal transport angles accommodate a variety of pan sizes on adjustable 1-1/2" centers.
- Powerful, yet efficient, 1500 Watt heating system maintains the right temperature to properly hold products. Heats up to 200˚F (93˚C).
- Standard solid state electronic control with large, clear, easy-to-read and operate LED digital display to ensure holding at precise food temperature.
- Internal frame in body maintains structural rigidity.
- Full perimeter bumper, rear push/pull handle and dry erase panel come standard on all models.
- Stainless steel construction throughout for ease of cleaning. One piece extended base protects cabinet body.
- Super duty composite side impact panel protection with ergonomic grips on both sides prevents damage to walls; allows for easy maneuvering.
- Insulated Dutch doors prevent temperature loss. Standard with right hand hinging; left hand hinging available upon request.
- Lockable slide bolt door latches ensure the doors stay closed even during the roughest transport.
- Smooth interior coved corners prevent food particle/grease buildup.
- Heavy duty 6" modulus casters, two with brakes. Provides mobility when fully loaded.

H-137-SUA-12D-SD

Standard solid state electronic control with large, clear, easy-to-read and operate LED digital display to ensure holding at precise food temperature

ACCESSORIES and OPTIONS (Available at extra cost):

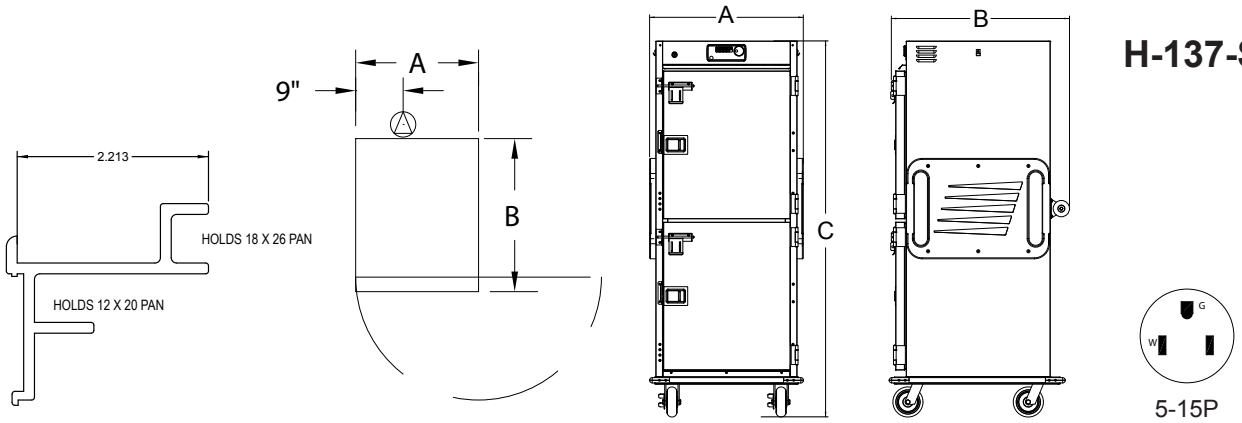
- ❑ Extra Transport Angles
- ❑ 208 or 240 Volt Service
- ❑ Upgrade to 2000 Watt Power Unit

See page B-20 for accessory details.

CRES COR®
5925 Heisley Road • Mentor, OH 44060-1833
Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com

GOLD

Gold indicates our Best Insulated Hot Cabinets with the best warranty in the industry.
3-Year Parts / 1-Year Labor.



H-137-SD SERIES

CRES COR MODEL NO.	PAN			DIM "A"	DIM "B"	DIM "C"	INSIDE DIMENSIONS				WEIGHT ACT.
	CAP/ ANGLES	SIZE		WIDTH	DEPTH	HEIGHT	WIDTH	DEPTH	HEIGHT		
H-137-SUA-12D-SD	12 SETS	SEE NOTE BELOW	IN	30-1/2	34-7/8	74-3/8	22	26-7/8	58	LBS	283
			MM	775	885	1890	560	685	1475	KG	128
H-137-SUA-9D-SD	9 SETS	SEE NOTE BELOW	IN	30-1/2	34-7/8	58-5/8	22	26-7/8	42	LBS	295
			MM	775	885	1490	560	685	1070	KG	134
H-137-SUA-6D-SD	6 SETS	SEE NOTE BELOW	IN	30-1/2	34-7/8	44-3/8	22	26-7/8	28	LBS	280
			MM	775	885	1130	560	685	715	KG	127

NOTE: Pan sizes 18" x 26" (460 x 660) Bun Pans, 12" x 20" (305 x 510) Steam Table Pans.

GOLD

Gold indicates our Best Insulated Hot Cabinets with the best warranty in the industry.
3-Year Parts / 1-Year Labor.

CABINET:

- Body: 22 ga. stainless steel.
- Reinforcement: Internal framework of 18 ga. 304 stainless steel.
- Insulation: Fiberglass, thermal conductivity (K factor) is .23 at 75˚F. 1-1/2" in doors, base top; 2" in sidewalls.
- Air tunnels: 22 ga. stainless steel; lift-out type, mounted on sides.
- Push/pull handle: Welded stainless steel with end bumpers; rear mounted.
- Interior coved corners.
- Super Duty composite side impact panel with ergonomic grips.
- Supplied with magnetic white erasable board, 12" x 12".

BASE:

- One piece construction, .125 aluminum; extended in rear for toe kick.
- Casters: 6" dia., modulus tires, 2" wide, load cap. 450 lbs. each, temp. range -40˚/+180˚F. Sealed ball bearings; permanently lubricated. Front casters equipped with brakes.
- Perimeter bumper: 1" non-marking gray rubber.

DUTCH DOORS:

- Formed 22 ga. stainless steel.
- Hinges: 11 ga. stainless steel, butt type.
- Gaskets: Perimeter type, silicone.
- Pan stop: Embossed.
- Latches: Polished stainless steel, slam type; flush mounted.
- Transport Latch: 12 ga. stainless steel slide with lockable hasp.

TRANSPORT PAN SLIDES:

- Extruded aluminum; mounted on locking lift-off posts.
- Spaced on 4-1/2" centers; adjustable on 1-1/2" centers.

Scan QR code to view Spec Sheet, Operating Manual, Wiring Diagram or to call Customer Service.

If you need a QR reader visit your App Store on your Smartphone or Tablet.

HOT UNIT COMPONENTS:

- Thermostat: Solid state digital display control, room ambient to 200˚F (93˚C).
- Switch: ON-OFF push button type.
- Power cord: Permanent, 10 ft., 14/3 ga.
- Heater: 1470 Watts (960 Watts for -UA6D)
- Blower motor.
- Vent Fan.
- Thermometer: Digital.

POWER REQUIREMENTS:

- For H137SUA9D and H137SUA12D: 1500 Watts, 120 Volts, 60 Hz., single phase, 12 Amps., 15 Amp. service.
- For H137SUA6D: 1000 Watts, 120 Volts, 60 Hz., single phase, 8.3 Amps., 15 Amp. service.

SHORT FORM SPECIFICATIONS

Cres Cor Insulated Hot Cabinet Model H-137-SUA-___D. Solid state electronic controlled time and temperatures. Cabinet 22 ga. stainless steel; stainless steel internal frame. (__) sets locking transport angles for multiple pan sizes, adjustable spacing every 1-1/2". Dutch doors, 22 ga. stainless steel. Fiberglass insulation in sides, 2"; doors, base, top 1-1/2". Interior coved corners. 1500 or 1000 Watt, 120 Volt power unit. One piece insulated base, .125 aluminum. 6" modulus casters, ball bearings. Load capacity 450 lbs. each. 3-Year Parts / 1-Year Labor warranty. Provide the following accessories: ____ ____ ____ . NSF, CSA-US, CSA-C listed. Energy Star Qualified.

CRES COR®
5925 Heisley Road • Mentor, OH 44060-1833
Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com

In line with its policy to continually improve its products, CRES COR reserves the right to change materials and specifications without notice.

Litho in U.S.A.

CRES COR®

JOB: _____

ITEM NO: _____

SUPER DUTY
CHILLTEMP® REFRIGERATED CABINET
MODEL R-171-SUA-10E-SD

R-171-SUA-10E-SD

FEATURES AND BENEFITS:

- Super duty composite side impact panel protection with ergonomic grips on both sides prevents damage to walls; allows for easy maneuvering.
- Fully insulated mobile ChillTemp® refrigerated cabinet for holding food and beverages at serving temperature.
- Lockable slide bolt door latches ensure the doors stay closed even during the roughest transport.
- Forced air system provides even distribution of cold air; cabinet maintains temperatures from 33˚F (.5˚ C) to 40˚F (4.5˚ C). Automatically defrosts.
- 1/3 horsepower compressor with automatic overload reset. R134a refrigerant for environmental compatibility.
- Full perimeter bumper, rear push/pull handle and dry erase panel come standard on all models.
- Stainless steel construction throughout for ease of cleaning. One piece extended base protects cabinet body.
- Self-closing insulated door prevents temperature loss. Magnetic door gaskets for proper seal.
- Insulated door prevents temperature loss. Standard with right hand hinging; left hand hinging available upon request.
- Generous 18-cubic foot interior.
- Ten sets of chrome plated wire angles accommodate a large variety of pan sizes on adjustable 1-1/2" centers.
- Heavy duty 6" modulus casters, two with brakes. Provides mobility when fully loaded.

C US

SANITATION NSF/ANSI 7

ACCESSORIES and OPTIONS (Available at extra cost):

- ❑ Menu Card Holder
- ❑ Corner Bumpers
- ❑ Polyurethane Casters
- ❑ 240 Volt Service
- ❑ Digital Thermometer
- ❑ Interior for (28) 18" x 26" pans

See page K-4 for accessory details.

CRES COR®
5925 Heisley Road • Mentor, OH 44060-1833
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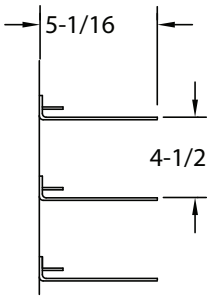
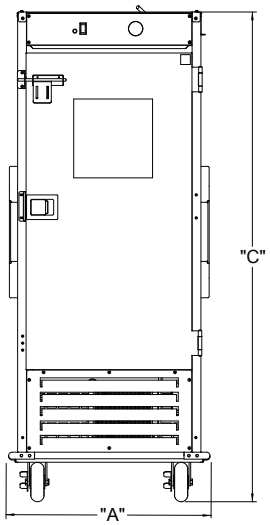
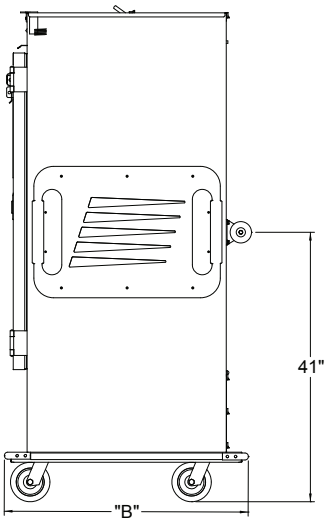
www.crescor.com

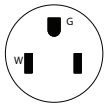
R-171-SUA-10E-SD



DETAIL OF
PAN SLIDE







5-15 P

CRES COR MODEL NO.	PAN			DIM "A"	DIM "B"	DIM "C"	INSIDE DIMENSIONS				WEIGHT ACT.
	CAP/ ANGLES	SIZE		WIDTH	DEPTH	HEIGHT	WIDTH	DEPTH	HEIGHT		
R-171-SUA-10E-SD	10 SETS	18 X 26	IN	30-7/16	40-1/2	77-1/8	23-1/2	29-3/4	47-3/8	LBS	408
			MM	773	1029	1959	597	755	1203	KG	186
	20 SETS	12 X 20	IN								
			MM								

CABINET:
- Body: 22 ga. stainless steel.
- Reinforcement: Internal framework of 18 ga. 304 stainless steel.
- Insulation: Fiberglass, thermal conductivity (K factor) is .23 at 75˚F. 1-1/2" in doors, base top; 2" in sidewalls.
- Push/pull handle: Welded stainless steel with end bumpers; rear mounted.
- Interior coved corners.
- Super Duty composite side impact panel with ergonomic grips.
- Supplied with magnetic white erasable board, 12" x 12".

BASE:
- One piece construction, .125 aluminum; extended in rear for toe kick.
- Casters: 6" dia., modulus tires, 2" wide, load cap. 450 lbs. each, temp. range -40˚/+180˚F. Sealed ball bearings; permanently lubricated. Front casters equipped with brakes.
- Perimeter bumper: 1" non-marking gray rubber.

DOOR:
- Formed 22 ga. stainless steel.
- Hinges: 11 ga. stainless steel, butt type.
- Gasket: Perimeter type, silicone.
- Pan stop: Embossed.
- Latch: Polished stainless steel, slam type; flush mounted.
- Transport Latch: 12 ga. stainless steel slide with lockable hasp.

PAN SLIDES:
- Wire angles (.306 dia.), nickel chrome plated steel, mounted on lift-off posts.
- Spaced on 4-1/2" centers; adjustable on 1-1/2" centers.

ELECTRICAL COMPONENTS:
- Thermostat: Pre-set to 38˚ F (3.3˚ C).
- Pilot light.
- Switch.
- Power cord: Permanent, 10 ft., 14/3 ga. with molded plug.
- Compressor: 1/3 h.p.
- Condensate evaporator: Electrical.
- R134a refrigerant.

POWER REQUIREMENTS:
- 120 Volts, 60 Hz., single phase, 15 Amp. service.

SHORT FORM SPECIFICATIONS

Cres Cor Refrigerated Cabinet Model R-171-SUA-10E-SD. Cabinet 22 ga. stainless steel; stainless steel internal frame. (10) sets of wire universal angles for multiple pan sizes, adjustable spacing every 1-1/2". Door, 22 ga. stainless steel. Foam insulation in sides and doors. Interior coved corners. 1/3 h.p. compressor, 120 Volts. One piece base, .125 aluminum. 6" swivel casters, ball bearings. Load capacity 450 lbs. each. 2-Year Parts / 1-Year Labor warranty. Provide the following accessories: _____ _____ _____. CSA-US/C, CSA to NSF7 listed.

CRES COR®
5925 Heisley Road • Mentor, OH 44060-1833
Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com

In line with its policy to continually improve its products, CRES COR reserves the right to change materials and specifications without notice.

Made in America Since 1936

BEVERAGE-AIR

Project: _____	AIA#
Item: _____	
Location: _____	SIS#
Approved:	

SCHOOL MILK COLD WALL COOLER

SM58HC Single Access Cooler
Hydrocarbon Series

MODEL:
SM58HC-S

3 Year Parts/Labor Warranty
Additional 4 Year Compressor Warranty

CABINET CONSTRUCTION

- Stainless steel exterior and interior
- Stainless steel lids, hinges doors and door latches
- Full electronic control
- Heavy-duty epoxy coated steel wire floor racks standard
- Floor drain is centrally located for easy cleaning, connecting to drain hose with hose adapter
- Flexible compression door gaskets ensure tight seal
- Self-latching doors/lids with safety bumpers
- Exterior thermometer
- Cylinder lock
- 4" Heavy-duty plate casters (2 with locks)
- Cold wall milk coolers are designed to hold product temperature during service. Product should be removed at the end of service and moved to long-term, refrigerated storage.

OPTIONS & ACCESSORIES

- Corner bumpers
- Cafeteria tray slide
- Graphics

REFRIGERATION SYSTEM

- Uses environmentally friendly, energy efficient R290 refrigerant, and meets all regulatory requirements for CARB, SNAP, DOE & more
- Maintains product temperature between 36º to 40ºF

SM58HC SINGLE ACCESS, COLD WALL: SCHOOL MILK SERIES

Please verify qualifying units by visiting:
www.energystar.gov/cfs

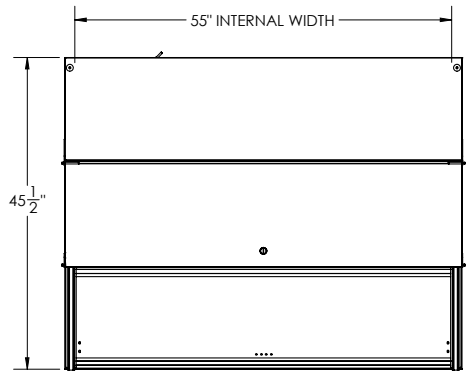
3779 Champion Blvd., Winston-Salem, NC 27105
1-888-845-9800 Fax: 1-336-245-6453
Beverage-Air.com Sales@bevair.com

BEVERAGE-AIR

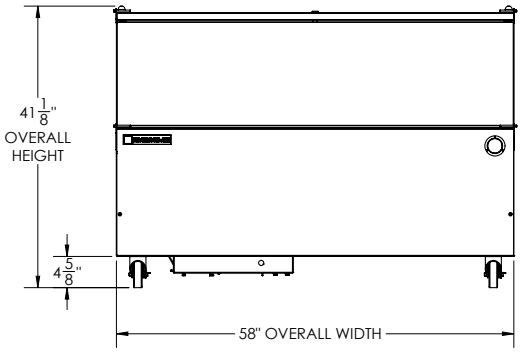
School Milk Cooler - Single Access
Model: SM58HC-S

MODEL	SM58HC-S
EXTERNAL DIMENSIONAL DATA	
Width Overall	58”
Depth Overall	30 ⅝”
Height Overall with Casters	41 ⅛”
Number of Lids/Doors	Single Access
Depth with Door Open 90º	45 ½”
INTERNAL DIMENSIONAL DATA	
NET Capacity (cubic ft.)	22.63
Internal Width Overall (in)	55”
Internal Depth Overall (in)	27”
Internal Height Usable (in)	25 ¾”
CASE CAPACITY	
13” X 13” X 11”	16
19” X 13” X 11”	10
ELECTRICAL DATA	
Full Load Amperes	2.2
REFRIGERATION DATA	
Horsepower	1/3
Capacity (BTU/Hr)	1434
SHIPPING DATA	
Gross Weight	384 lbs
Height - Crated	48”
Width - Crated	61”
Depth - Crated	34”

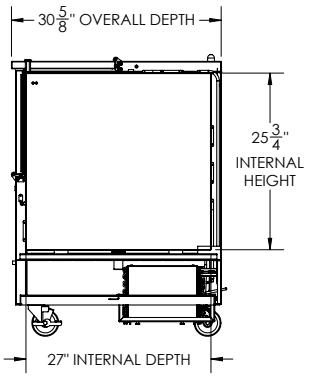
Model Views



PLAN VIEW



ELEVATION VIEW



SIDE VIEW

ELECTRICAL CONNECTION

115/60/1
NEMA 5-15P

Units pre-wired at factory and include 8’ long cord and plug set.

PIPER ELITE 500

Bloomington Cold

Extra Deep Cold Pan - Listed NSF/ANSI Standard 7

3-BCM-SD

The Piper Elite 500 Bloomington mechanically refrigerated, extra deep well unit is listed NSF/ANSI Standard 7. Food is recessed on easily removable rails in the pan for maximum cooling efficiency without the use of ice and is ideal as a salad bar merchandiser. Elite 500 units are compatible and will interlock with other Elite 500 units.

STANDARD FEATURES

- 14-gauge stainless steel top with 1-1/2" turndown on all sides
- Top secured by four recessed bolts for easy access
- 14-gauge stainless steel legs fastened to 18-gauge stainless steel bottom shelf
- 20-gauge stainless steel end and front panels are attached to legs
- 20-gauge stainless steel fully welded 9-7/16" deep well
- Welded watertight well has concealed continuous refrigerated coil bonded to the sides and is fully insulated
- Cold pan has a 1" drain with shut off valve located below the unit on operator's left side. Valve is 3/4" FTP.
- Sliding doors
- Louvered panels for ventilation of condensing unit
- End louver panel removable to access compressor
- 5" diameter swivel plate casters, 2 with brakes
- Interlocking mechanism is provided to interlock with other Elite 500 units

JOB_____ ITEM # _____ QTY # _____

MODEL NUMBER

- ❑ 2-BCM
- ❑ 3-BCM
- ❑ 4-BCM
- ❑ 5-BCM
- ❑ 6-BCM

DIMENSIONS

- 2-BCM - 36"H x 28"D x 32"L
- 3-BCM - 36"H x 28"D x 46"L
- 4-BCM - 36"H x 28"D x 60"L
- 5-BCM - 36"H x 28"D x 74"L
- 6-BCM - 36"H x 28"D x 88"L
- 36" height on all standard units
- 30" height is available on Petite Elite units
- 28" width
- 32" to 88" length in 14" increments
- **Optional: Pizzazz Powder Coating in lieu of Stainless Steel**

NSF/ANSI STANDARD 7

This unit is listed with CSA in NSF/ANSI Standard 7 for design and construction and has been performance tested for the storage of potentially hazardous foods. The performance test criteria is holding a food-like media at or below 41°F without any freezing for four hours at 86°F ambient temperature.

ELECTRICAL

- 120 volts single-phase
- Eight foot electrical cord with NEMA 5-15P plug
- On/Off switch and pilot light mounted on control panel of unit's operator side

REFRIGERATION SYSTEM

- 1/3 horsepower compressor
- Fan-cooled condensing unit with an expansion valve pressure control switch
- Refrigerant coils shall be of copper tubing wrapped around the sides of the well

WARRANTY

- One year parts and labor. Warranty is detailed on inside front cover of the price list.

SPEC A-5

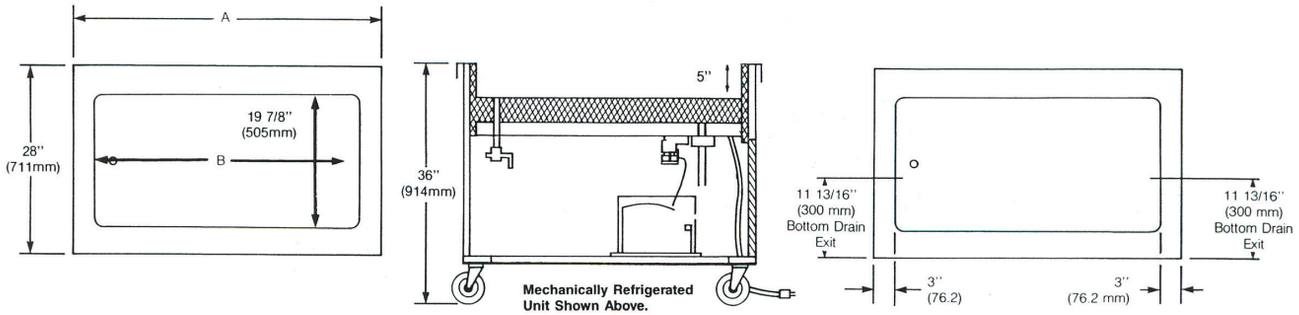
PIPER
The Food-Focused Equipment Company
a CFSBRANDS company
www.piperonline.net

300 S. 84th Avenue
Wausau, WI 54401
Phone: 800-544-3057
Fax: 715-842-3125

PIPER ELITE 500

Bloomington Cold

Extra Deep Cold Pan - Listed NSF/ANSI Standard 7



BLOOMINGTON COLD FOOD UNIT SPECIFICATIONS

Model#	*12x20 Pan Capacity	(A)	(B)	Width	Height	*Amperage 120V	*NEMA Cap No.	Ship Wt. (lbs)
2-BCM	2	32”	36.25"	28”	36”	6.3	5-15P	320
3-BCM	3	46”	40.25"	28”	36”	6.3	5-15P	360
4-BCM	4	60”	54.25"	28”	36”	6.3	5-15P	405
5-BCM	5	74”	68.25"	28”	36”	6.3	5-15P	440
6-BCM	6	88”	82.25"	28”	36”	6.3	5-15P	480

*Amperage/NEMA plug type may vary with options.

DIMENSION ADDITIONS FOR OPTIONS

- Add 23-3/4” to height for buffet protector guard
- Add 14” to height for cafeteria protector guard
- Add 22-3/4” to height for double display shelf
- Add 8” to width for cutting board
- Add 12-3/4” to width for solid ribbed tray slide
- Add 12-1/2” to width for 3-bar tray slide

Note: Line-up drawing required when ordering false front, cashier stand or interconnected units.

OPTIONS / ACCESSORIES

	Part #	Description
❑	PPC	Pizzazz Powder Coating
❑	SCB	8” stainless steel cutting board, flush with top
❑	MCB	8” maple cutting board, flush with top
❑	SRTS	Solid 3-ribbed tray slide, 16-gauge stainless steel
❑	3BTS	3-bar tray slide
❑	MBS	18” maple end bread shelf; left, right - flush with top
❑	SBS	18” stainless steel end bread shelf; left, right - flush with top
❑	CPG	Cafeteria protector guard (no heat or lights)
❑	CPGL	Cafeteria protector guard with incandescent lights
❑	CPGFL	Cafeteria protector guard with fluorescent lights
❑	CPGHL	Cafeteria protector guard with heat and lights
❑	CDD	Cafeteria double display (no heat or lights)
❑	CDDL	Cafeteria double display with fluorescent lights
❑	BPG1	Buffet single side protector guard (no heat or lights)
❑	BPG1IL	Buffet single side protector guard with incandescent lights
❑	BPG1FL	Buffet single side protector guard with fluorescent lights
❑	BPG	Buffet double side protector guard (no heat or lights)

	Part #	Description
❑	BPGIL	Buffet double side protector guard with incandescent lights
❑	BPGFL	Buffet double side protector guard with fluorescent lights
❑	BPGH	Buffet double side protector guard with heat strip
❑	BDD	Buffet double display two-sided protector guard
❑	BPGC	Buffet classic two-sided protector guards
❑	CPGC	Cafeteria Style Classic (1-5/8) protector guards
❑	CDDC	Cafeteria Style Classic Double Display protector guards
❑	BPG1C	Buffet Style Classic Single Sided protector guards
❑	SCPGC	Cafeteria Style Classic Single protector guards
❑	SSL	Legs in lieu of casters
❑	DOUT	Duplex outlet (120V, 15 AMP)
❑	FRMAD	Formica laminate finish without doors
❑	CUT	Cut out for drop in dispensers.
❑	UCR-1	Refrigerated storage base with doors - for units 60” or larger
❑	UCR-2	Refrigerated storage base 74” or larger
❑	SKR	Skirting
❑	CEG	Cafeteria end guards, right or left
❑	HD	Hinged doors

A-5 SPEC

PIPER
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www.piperonline.net

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Wausau, WI 54401
Phone: 800-544-3057
Fax: 715-842-3125

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SIGNATURE

DATE

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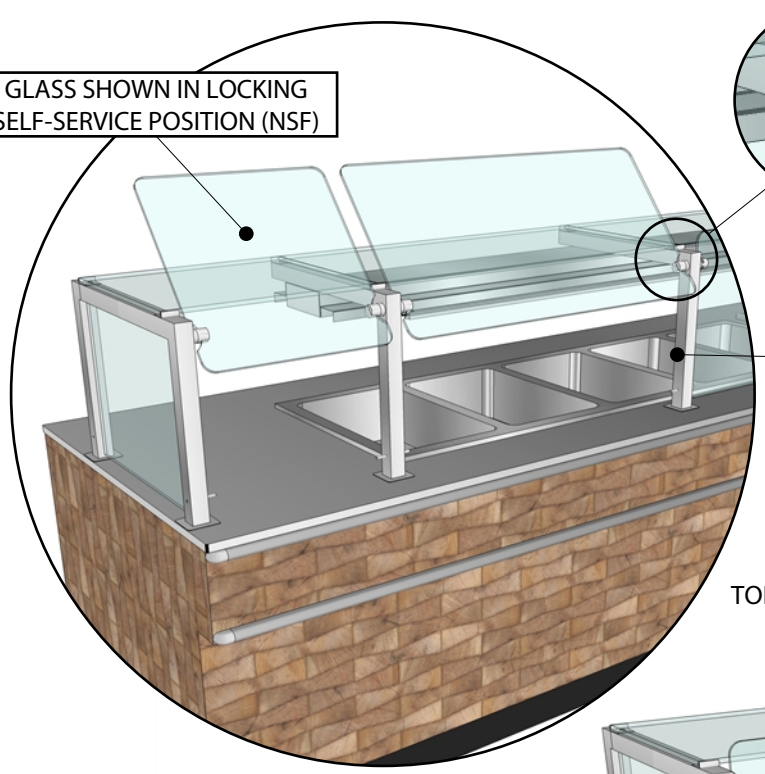
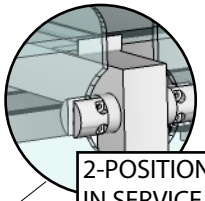
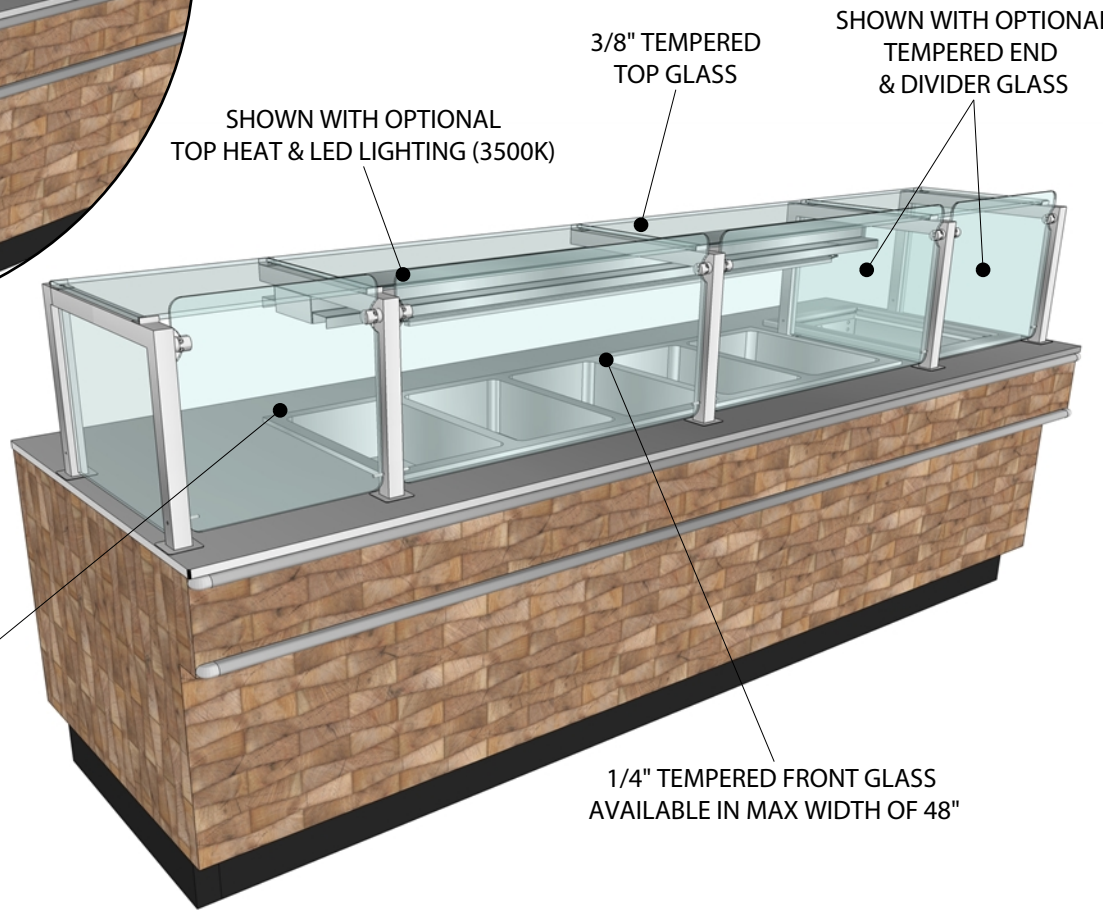




CONSTRUCTED OF 1-1/2" SQUARE TUBING
(BRUSHED STAINLESS STEEL OR POWDER COATED FINISH)



CONVERTIBLE GUARD SHOWN ON PIPER INLINE HOT/COLD BAR

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS

1	NTE 3/7/2018

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Date: 1-31-2018

Sheet No.
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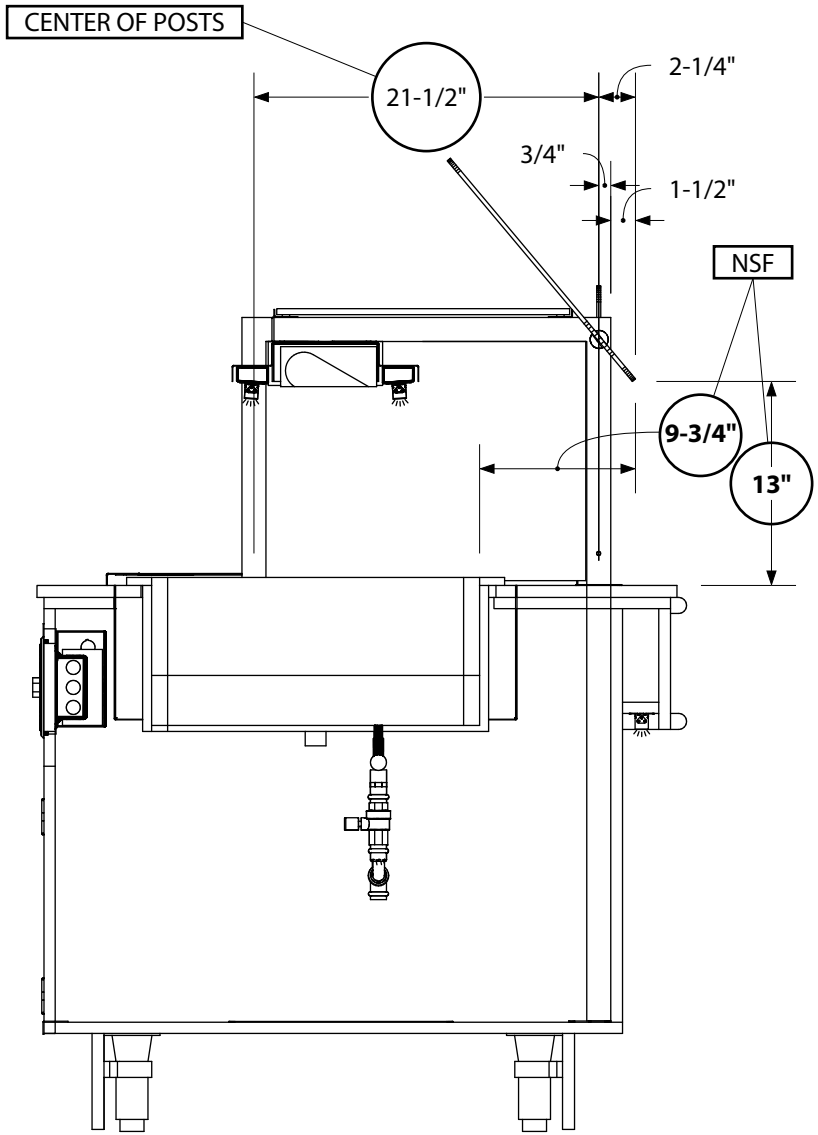
TYPICAL ALIGNMENT OF FOOD PAN IN REFERENCE TO SELF-SERVICE GLASS (NSF)



1 Section View - NSF

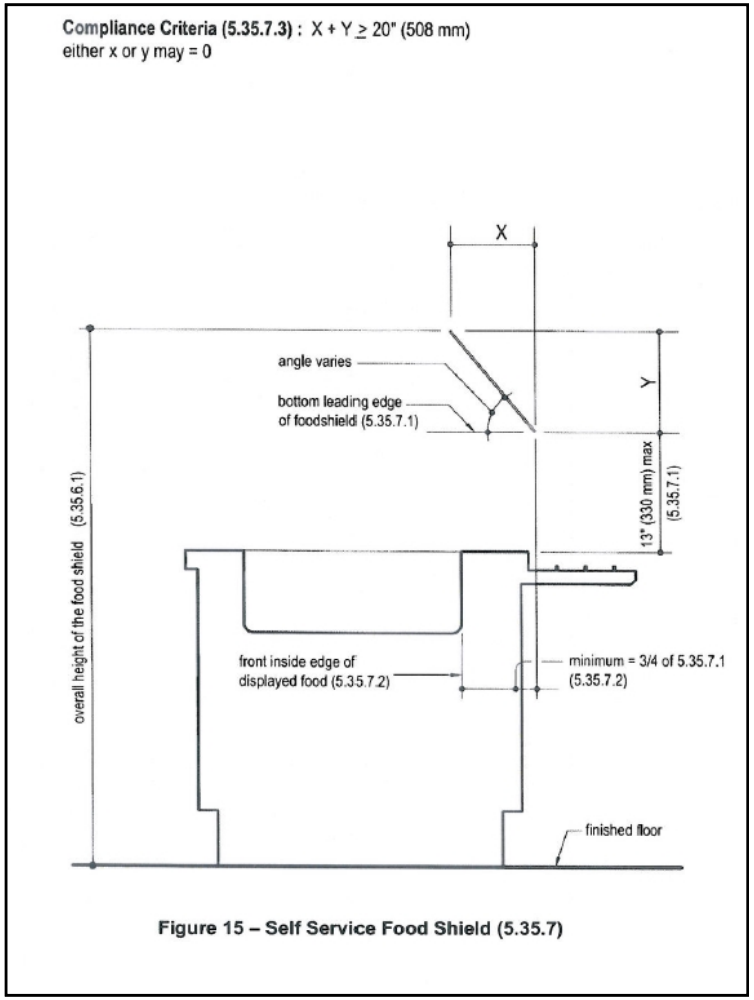


Figure 15 – Self Service Food Shield (5.35.7)

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

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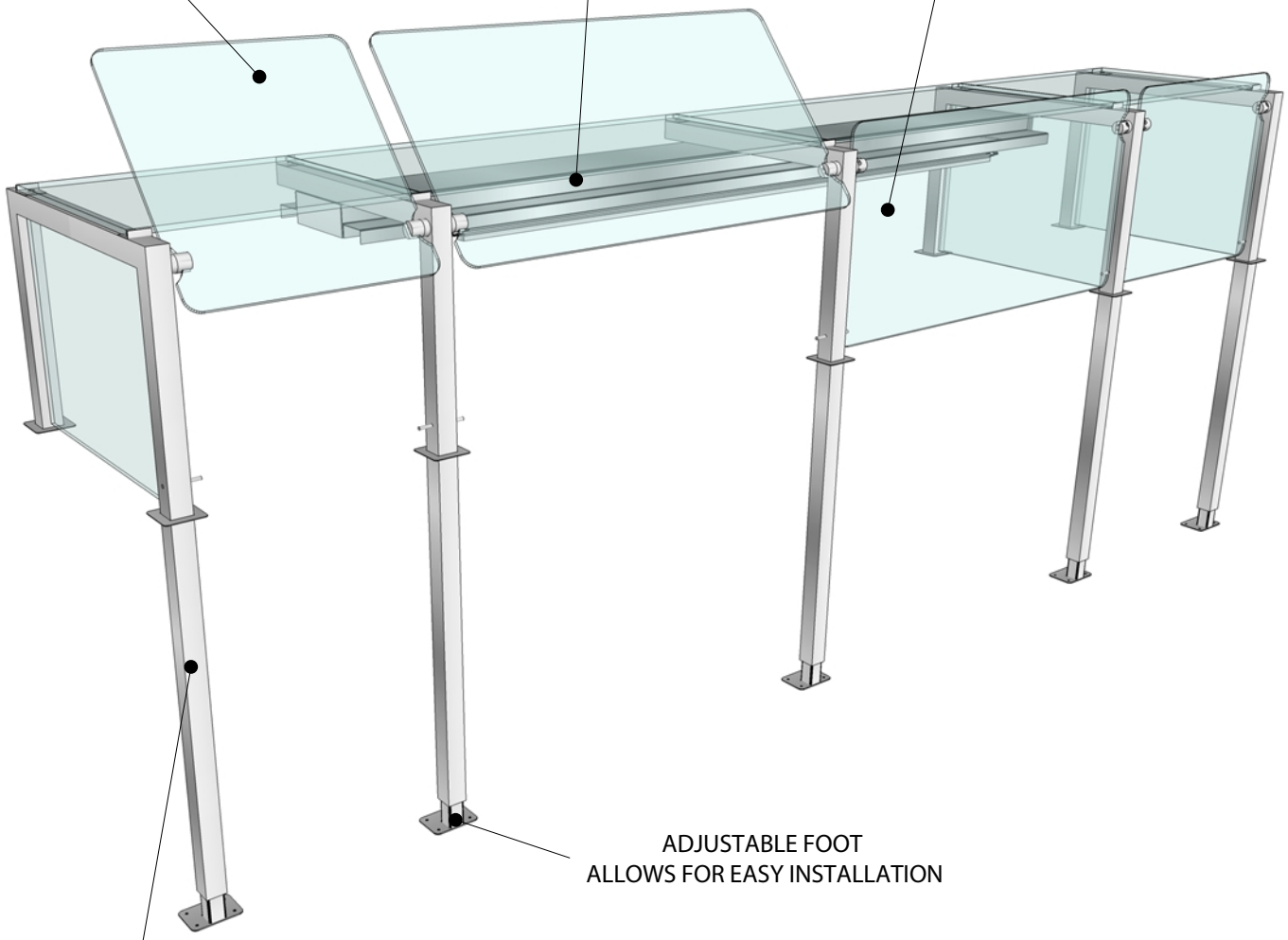
sales@rdfixtures.com

AVAILABLE IN OVERHEAD LED LIGHTING
OR OVERHEAD HEAT WITH LED LIGHTING
BOTH WITH STAINLESS STEEL SHROUD

GLASS SHOWN IN SELF-SERVICE POSITION

GLASS SHOWN IN SERVICE POSITION



ADJUSTABLE FOOT
ALLOWS FOR EASY INSTALLATION

FRONT SQUARE TUBING EXTENDS THROUGH COUNTERTOP
FOR ADDED STRENGTH AND INCREASED SPAN
(OPTIONAL SHORTER FRONT POSTS FOR SHORTER SPANS)

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS	
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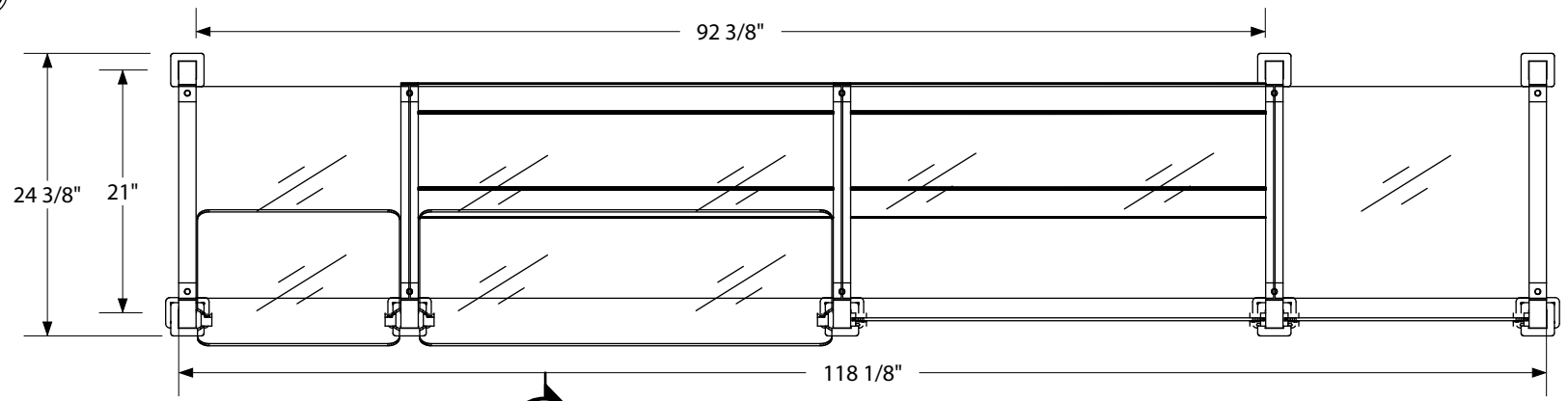
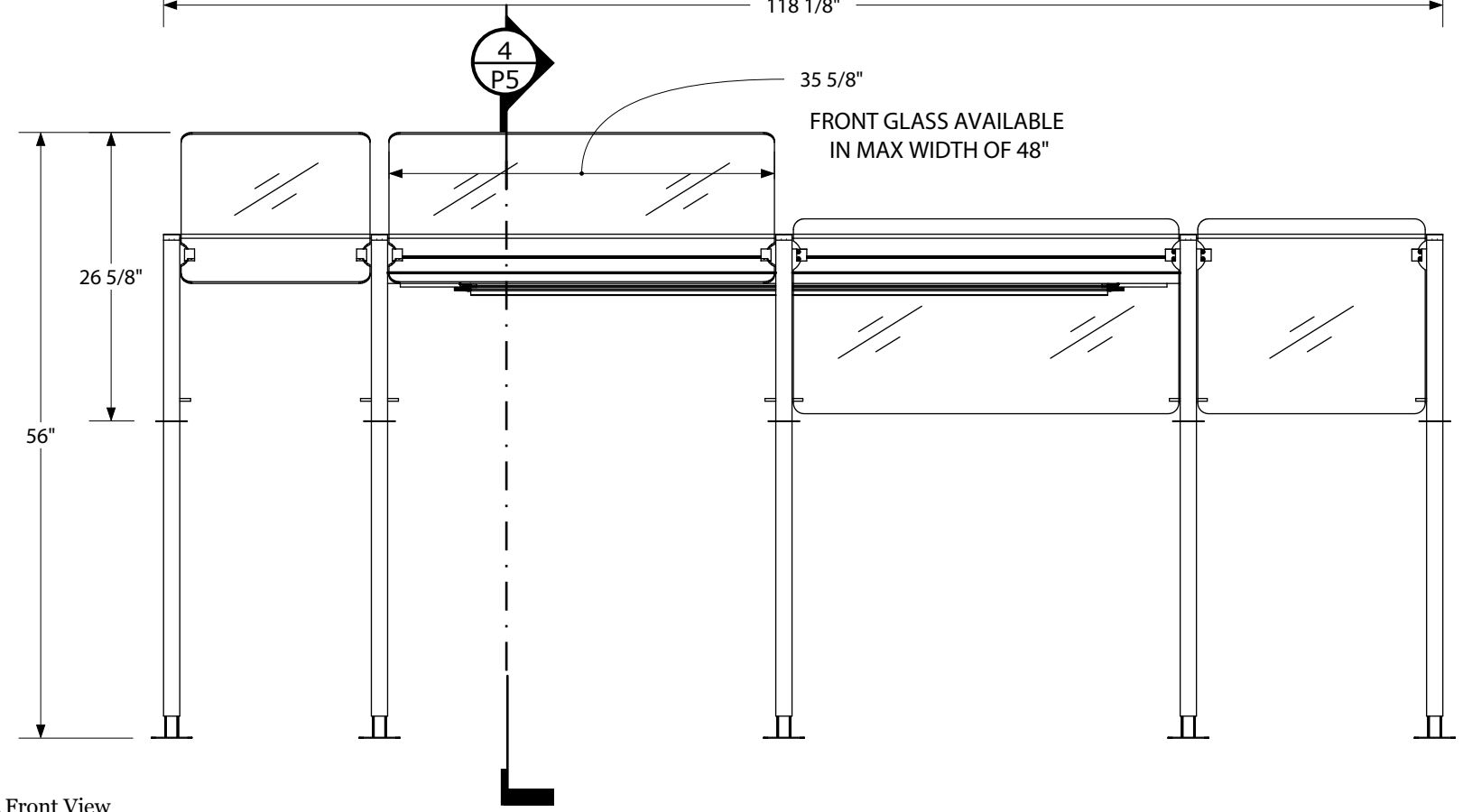
2 Plan View





3 Front View

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

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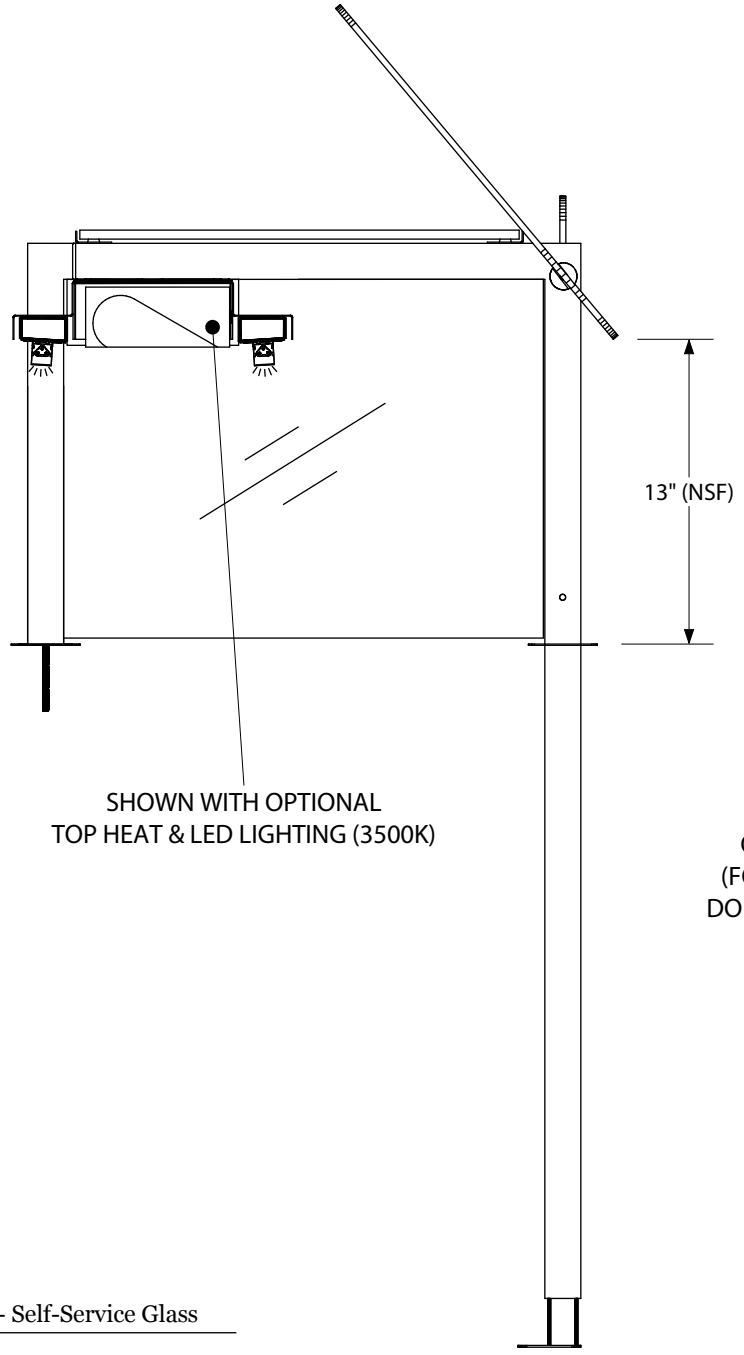

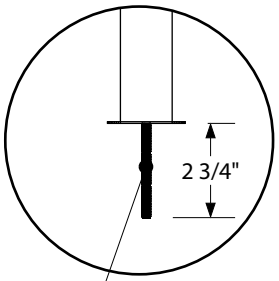

4 Section View - Self-Service Glass

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Sheet No.
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Project #
45700-01

PIPER ELITE 500

Solid Top Unit

3-ST shown with optional elementary height solid tray slide and formica finish

The Elite 500 Solid Top's versatile modular design allows you to custom design either a cafeteria or a buffet line-up. Elite 500 units are compatible and will interlock with other Elite 500 units. This allows the units to be disconnected for cleaning under the serving line. With Elite 500 you choose only the options and accessories that you want and need.

STANDARD FEATURES

- 14-gauge stainless steel top with 1-1/2" turn down on all sides
- Top secured by four recessed bolts
- 14-gauge stainless steel legs fastened to 18-gauge stainless steel bottom shelf
- 20-gauge stainless steel end and front panels are attached to legs
- Open control side for additional storage capacity
- 5" diameter swivel plate casters, 2 with brakes
- Interlocking mechanism is provided to interlock with other Elite 500 units

JOB_____ ITEM # _____ QTY # _____

MODEL NUMBER

- ❑ 2-ST (500)
- ❑ 3-ST (500-1)
- ❑ 4-ST (500-2)
- ❑ 5-ST (500-3)
- ❑ 6-ST (500-4)

DIMENSIONS

- 2-ST(500) - 36"H x 28"D x 32"L
- 3-ST(500-1) - 36"H x 28"D x 46"L
- 4-ST(500-2) - 36"H x 28"D x 60"L
- 5-ST (500-3)- 36"H x 28"D x 74"L
- 6-ST(500-4) - 36"H x 28"D x 88"L
- 36" height on all standard units
- 30" height is available on Petite Elite units
- 28" width
- 32" to 88" length in 14" increments

COMMON OPTIONS

- **PIZZAZZ POWDER COATING IN LIEU OF STAINLESS STEEL**
- Tray slides
- Protector guards
- Hinged or sliding doors
- See reverse side for additional options.

WARRANTY

One year parts and labor. Warranty is detailed on inside front cover of the price list.

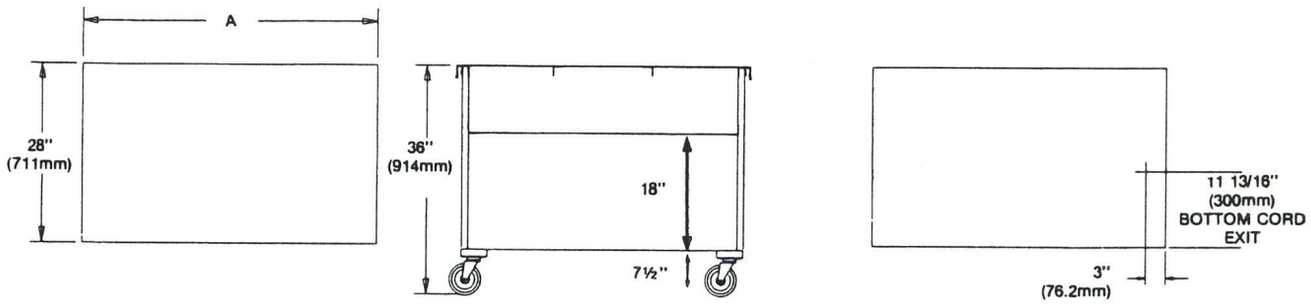
SPEC A-3

PIPER
The Food-Focused Equipment Company
a CFSBRANDS company
www.piperonline.net

300 S. 84th Avenue
Wausau, WI 54401
Phone: 800-544-3057
Fax: 715-842-3125

PIPER ELITE 500

Solid Top Unit



SOLID TOP UNIT SPECIFICATIONS

Model#	Length	Width	Height	Ship Wt. (lbs)
2-ST(500)	32”	28”	36”	225
3-ST(500-1)	46”	28”	36”	265
4-ST(500-2)	60”	28”	36”	302
5-ST(500-3)	74”	28”	36”	345
6-ST(500-4)	88”	28”	36”	385

DIMENSION ADDITIONS FOR OPTIONS

- ❑ Add 23-3/4” to height for buffet protector guard
- ❑ Add 14” to height for cafeteria protector guard
- ❑ Add 22-3/4” to height for double display shelf
- ❑ Add 8” to width for cutting board
- ❑ Add 12-3/4” to width for solid ribbed tray slide
- ❑ Add 12-1/2” to width for 3-bar tray slide

Note: Line-up drawing required when ordering false front, cashier stand or interconnected units.

OPTIONS / ACCESSORIES

	Part #	Description
❑	PPC	Pizzazz Powder Coating
❑	SCB	8” stainless steel cutting board, flush with top
❑	MCB	8” maple cutting board, flush with top
❑	SRTS	Solid 3-ribbed tray slide, 16-gauge stainless steel
❑	3BTS	3-bar tray slide
❑	MBS	18” maple end bread shelf; left, right - flush with top
❑	SBS	18” stainless steel end bread shelf; left, right - flush with top
❑	CPG	Cafeteria protector guard (no heat or lights)
❑	CPGL	Cafeteria protector guard with incandescent lights
❑	CPGFL	Cafeteria protector guard with fluorescent lights
❑	CPGHL	Cafeteria protector guard with heat and lights
❑	CDD	Cafeteria double display (no heat or lights)
❑	CDDL	Cafeteria double display with fluorescent lights
❑	BPG1	Buffet single side protector guard (no heat or lights)
❑	BPG1IL	Buffet single side protector guard with incandescent lights
❑	BPG1FL	Buffet single side protector guard with fluorescent lights

	Part #	Description
❑	BPG	Buffet double side protector guard (no heat or lights)
❑	BPGIL	Buffet double side protector guard with incandescent lights
❑	BPGFL	Buffet double side protector guard with fluorescent lights
❑	BPGH	Buffet double side protector guard with heat strip
❑	BDD	Buffet double display two-sided protector guard
❑	BPGC	Buffet classic two-sided protector guards
❑	CPGC	Cafeteria Style Classic (1-5/8) protector guards
❑	CDDC	Cafeteria Style Classic Double Display protector guards
❑	BPG1C	Buffet Style Classic Single Sided protector guards
❑	SCPGC	Cafeteria Style Classic Single protector guards
❑	SSL	Legs in lieu of casters
❑	DOUT	Duplex outlet (120V, 15 AMP)
❑	FRMA	Formica laminate finish without doors
❑	CUT	Cut out for drop in dispensers.
❑	UCR-1	Refrigerated storage base with doors - for units 60” or larger
❑	UCR-2	Refrigerated storage base 74” or larger
❑	INT	Intermediate shelf

A-3 SPEC

PIPER
The Food-Focused Equipment Company
a CFSBRANDS company
www.piperonline.net

300 S. 84th Avenue
Wausau, WI 54401
Phone: 800-544-3057
Fax: 715-842-3125

LIMITED WARRANTY: PIPER PRODUCTS warrants to the original purchaser parts and labor for a period of twelve (12) months from the date of purchase. See manufacturer’s complete warranty for details.

It is our policy to build equipment which is design certified by companies that have been accredited at the Federal Level by the Occupational Safety and Health Agency (OSHA) and ANSI as a National Recognized Testing Laboratory. These companies include CSA International, Underwriters Laboratories, and the National Sanitation Foundation. However, a continuing program of product improvement makes it necessary to submit new models to the agencies as they are developed. Consequently, all models may not bear the appropriate labels at all times.

We reserve the right to change specifications and product design without notice. Such revisions do not entitle buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment. Information is not for design purposes.

PIPER ELITE 500

Hot Food Unit

JOB_____ ITEM # _____ QTY # _____

MODEL NUMBER

- ❑ 2-HF (501-2)
- ❑ 3-HF (501-3)
- ❑ 4-HF (501-4)
- ❑ 5-HF (501-5)
- ❑ 6-HF (501-6)

FoodSafe™

3-HF Elite 500 shown with optional 3-bar tray slide and formica finish

The versatile modular design of the Elite 500 Serving System Hot Food units allows you to customize your cafeteria or a buffet line-up. Elite 500 units are compatible and will interlock with other Elite 500 units. This design allows the units to be disconnected for cleaning under the serving line. With Elite 500 you choose only the options and accessories that you want and need for your line-up.

Only Piper's equipment has the advantage of FoodSafe technology and certification. This ensures that your food is kept "out of the **Danger-Zone**." Food spoilage occurs mainly because of rapidly accelerated bacteriological activity within the 40F-140F **"Danger Zone."**

With FoodSafe hot food stays above 140F longer and cold food is kept below 40F. Both are key factors in HACCP compliance and the fight against foodborne pathogens.

STANDARD FEATURES

- 14-gauge stainless steel top with 1-1/2" turndown on all sides
- Top secured by four recessed bolts for easy access
- 14-gauge stainless steel legs fastened to
- 18-gauge stainless steel bottom shelf, open control side
- Open control side for additional storage capacity
- 20-gauge stainless steel end and front panels are attached to legs
- 20-gauge stainless steel bottom-mounted wells, 6-1/2" deep with coved corners
- 2" insulation on sides and between wells, 1-1/2" on bottom, 1" on the ends and 1/4" fiber frax all around
- 1000 watt tubular heating element for each well is individually and thermostatically controlled
- Wells can be run wet or dry
- 5" diameter swivel plate casters, 2 with brakes
- Interlocking mechanism is provided to interlock with other Elite 500 units.
- Drain valve exits operator's left side as standard. Drain valve is 3/4" FPT.
- Common drains and manifolds

DIMENSIONS

- 2-HF (501-2) - 36"H x 28"D x 32"L
- 3-HF (501-3) - 36"H x 28"D x 46"L
- 4-HF (501-4) - 36"H x 28"D x 60"L
- 5-HF (501-5) - 36"H x 28"D x 74"L
- 6-HF (501-6) - 36"H x 28"D x 88"L
- 36" height on all standard units
- 30" height is available on Petite Elite 500 units
- 28" width
- 32" to 88" length in 14" increments

ELECTRICAL

- Two, three and four well units are available 120 volts
- All units available in 208 or 240 volt, single- phase standard
- Eight foot electrical cord and plug
- Some options or accessories may not be available with certain voltages

COMMON OPTIONS

- **PIZZAZZ POWDER COATING IN LIEU OF STAINLESS STEEL**
- Tray slides
- Protector guards
- Hinged or sliding doors
- See reverse side for additional options

WARRANTY

One year parts and labor. Warranty is detailed on inside front cover of the price list.

SPEC A-1

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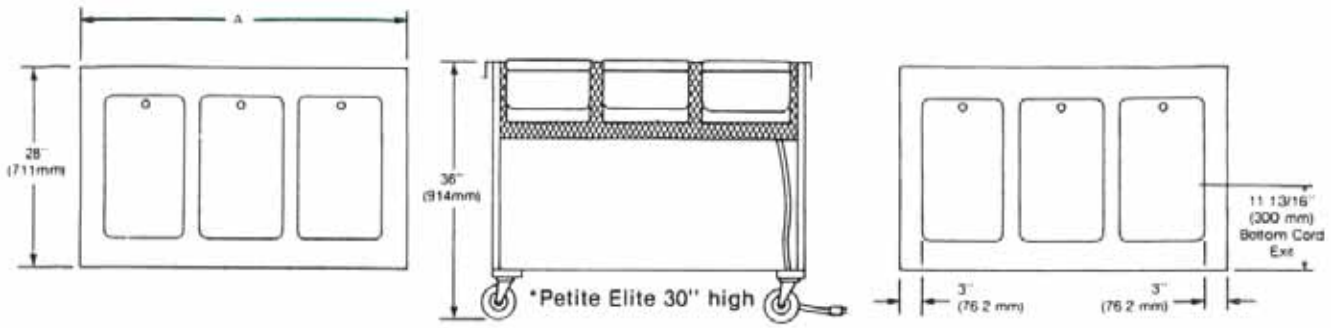
PIPER ELITE 500

Hot Food Unit



Model#	# of Wells	A	Watts	120V	Amps 208V	240V	NEMA Cap Number 120V	208V	240V	Ship Wt. (lbs)
2-HF (501-2)	2	32"	2000	16.7	9.6	8.3	5-30P	6-15P	6-15P	300
3-HF (501-3)	3	46"	3000	25.0	14.4	12.5	5-50P	6-20P	6-20P	310
4-HF (501-4)	4	60"	4000	33.3	19.2	16.7	5-50P	6-30P	6-30P	335
5-HF (501-5)	5	74"	5000	N/A	24.0	20.8	N/A	6-30P	6-30P	375
6-HF (501-6)	6	88"	6000	N/A	28.8	25.0	N/A	6-50P	6-50P	400

Spacing between wells is 2". Floor clearance of unit is 6-1/4". Clearance height of open under storage is 17-3/4". Open under storage widths are 22-3/16", 36-3/16",50-3/16", 64-3/16", and 78-3/16".

DIMENSION ADDITIONS FOR OPTIONS

- Add 23-3/4" to height for buffet protector guard
- Add 14" to height for cafeteria protector guard
- Add 22-3/4" to height for double display shelf
- Add 8" to width for cutting board
- Add 12-3/4" to width for solid ribbed tray slide
- Add 12-1/2" to width for 3-bar tray slide

Note: Line-up drawing required when ordering false front, cashier stand or interconnected units.

	Part #	Description
❑	PPC	PIZZAZZ POWDER COATING
❑	SCB	8" stainless steel cutting board, flush with top
❑	MCB	8" maple cutting board, flush with top
❑	SRTS	Solid 3-ribbed tray slide, 16-gauge stainless steel
❑	3BTS	3-bar tray slide
❑	MBS	18" maple end bread shelf; left, right - flush with top
❑	SBS	18" stainless steel end bread shelf; left, right - flush with top
❑	HD	Hinged doors with solid bottom
❑	SD	Sliding doors with solid bottom
❑	CPG	Cafeteria protector guard (no heat or lights)
❑	CPGL	Cafeteria protector guard with incandescent lights
❑	CPGFL	Cafeteria protector guard with fluorescent lights
❑	CEG	Cafeteria end guards, right or left
❑	INT	Intermediate shelf
❑	FPB	Full perimeter bumper

	Part #	Description
❑	BPG1	Buffet single side protector guard (no heat or lights)
❑	BPG1IL	Buffet single side protector guard with incandescent lights
❑	BPG1FL	Buffet single side protector guard with fluorescentlights
❑	BEG	Buffet end guards, right or left
❑	BDD	Buffet double display two-sided protector guard
❑	BPGC	Classic protector guards
❑	CPGC	Cafeteria Style Classic Single protector guard
❑	BPG1C	Buffet Style Classic Single Sided protector guard
❑	SCPGC	Cafeteria Style Classic Single protector guards
❑	SSL	Legs in lieu of casters
❑	DOUT	Duplex outlet (120V, 15 AMP)
❑	FRMA	Formica laminate finish
❑	FLP	Filler Strips
❑	FF	Fill Faucet
❑	SKR	Skirting

A-1 SPEC

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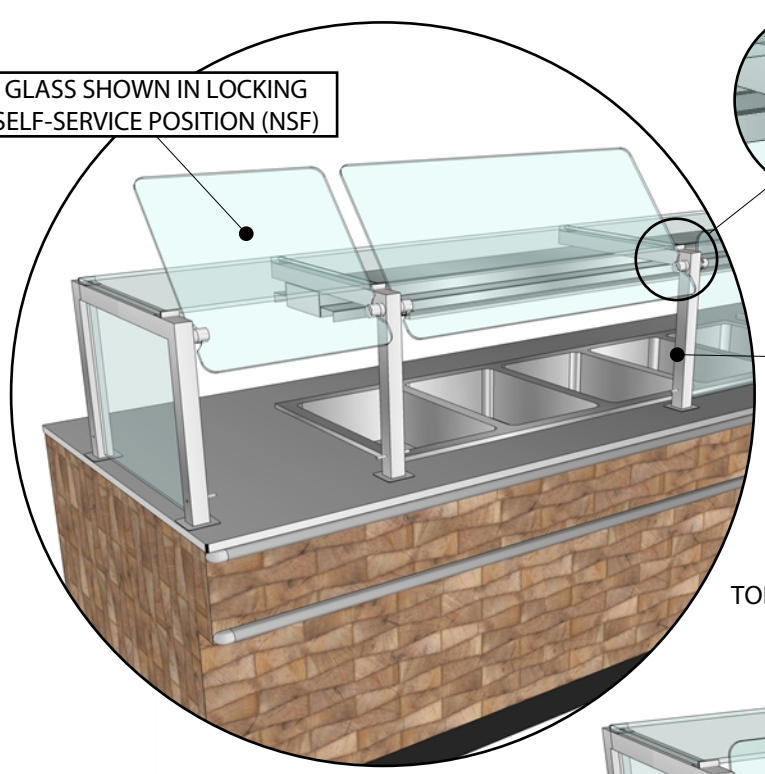

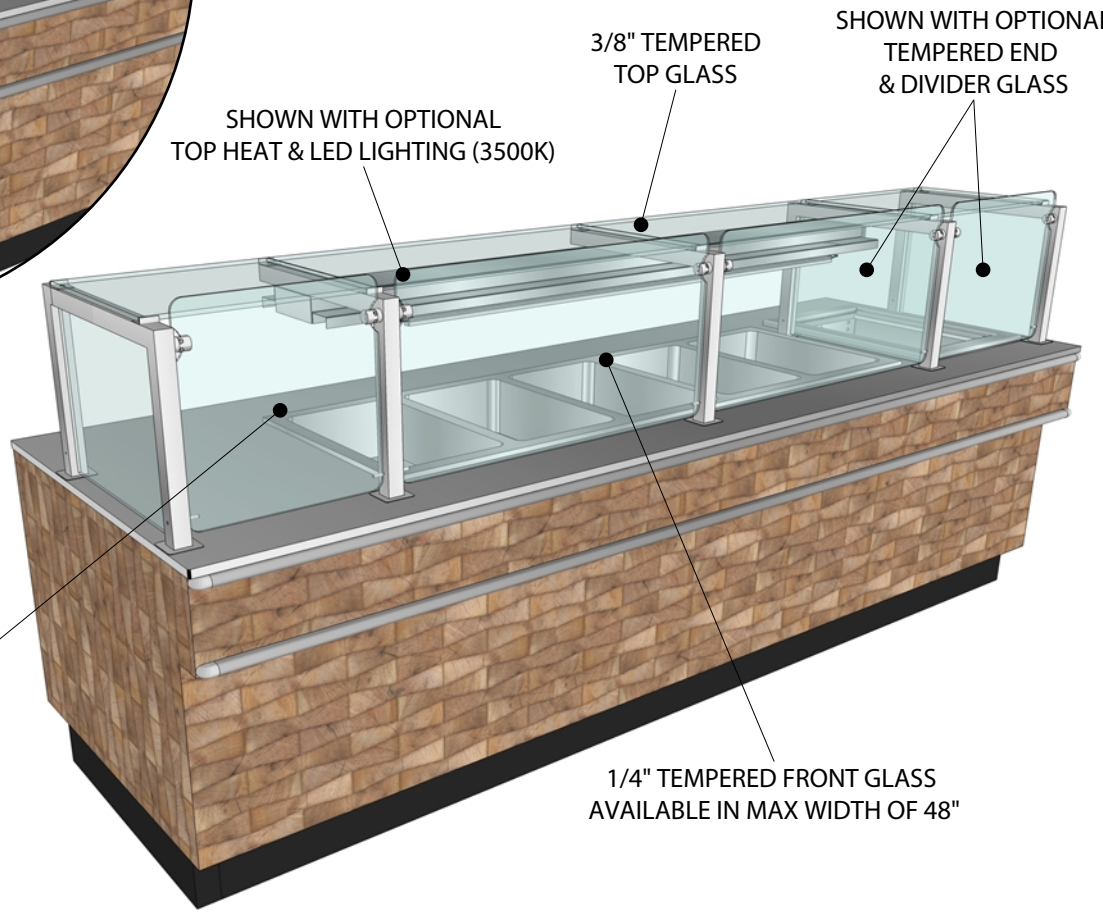

CONVERTIBLE GUARD SHOWN ON PIPER INLINE HOT/COLD BAR

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS	
1	NTE 3/7/2018

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Sheet No.
1 of 5

Project #
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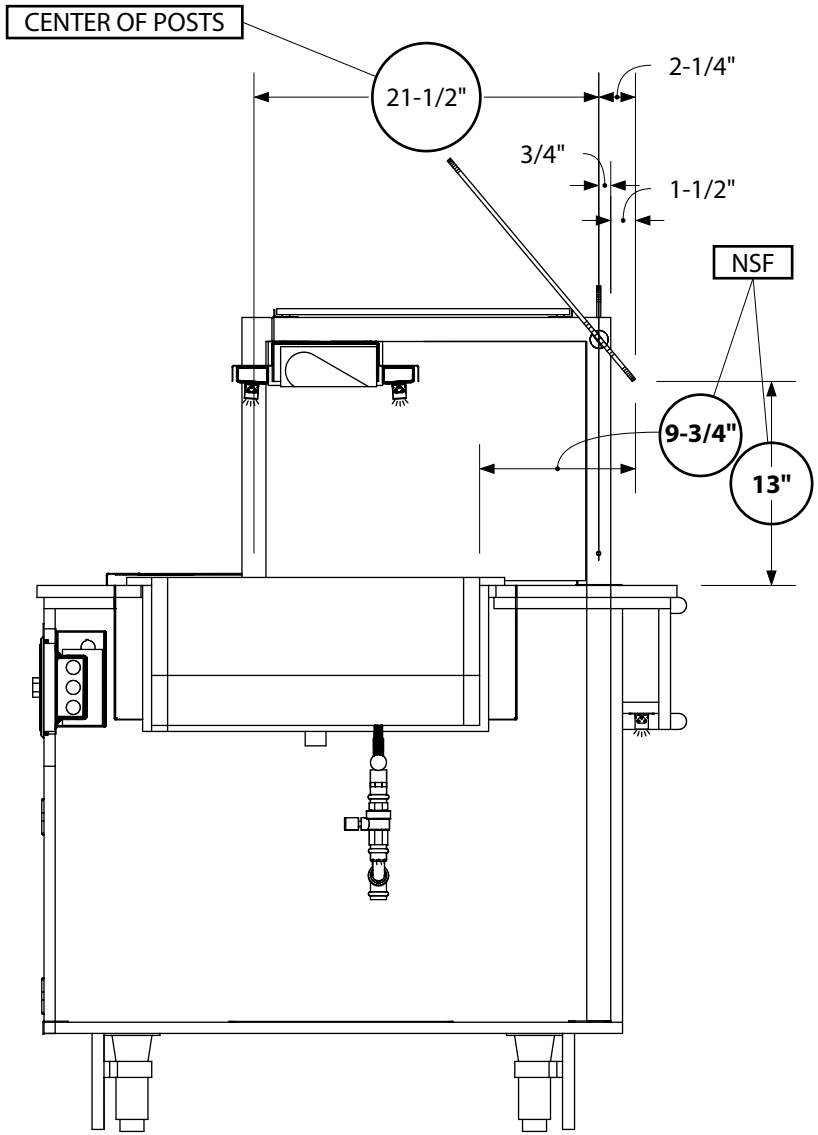
TYPICAL ALIGNMENT OF FOOD PAN IN REFERENCE TO SELF-SERVICE GLASS (NSF)



1 Section View - NSF

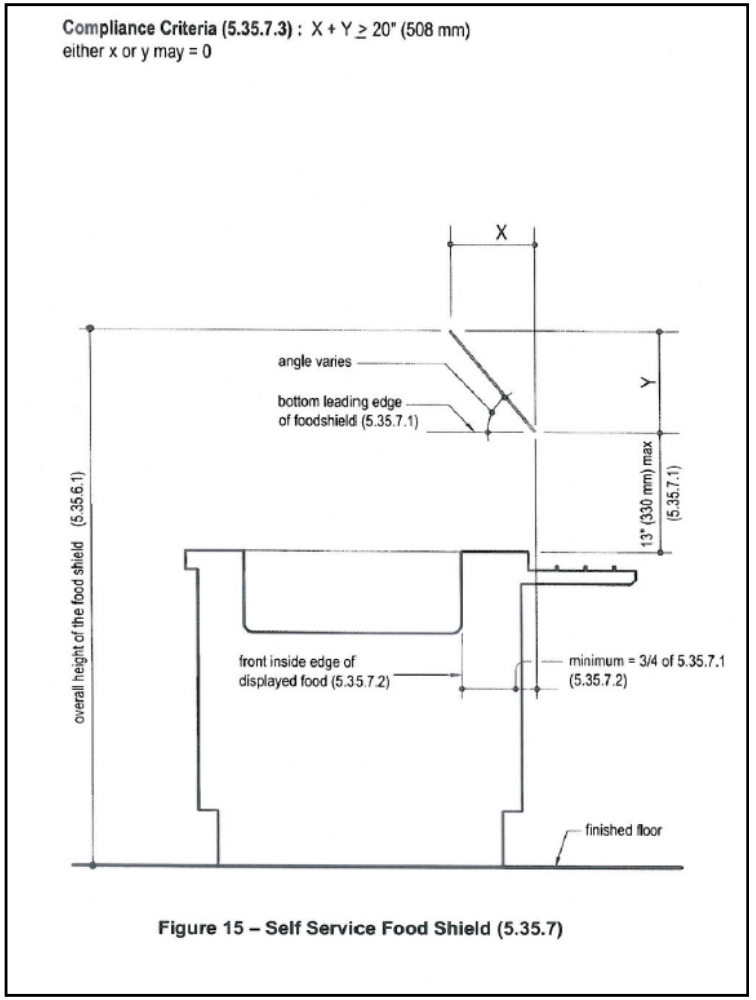


Figure 15 – Self Service Food Shield (5.35.7)

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

REVISIONS

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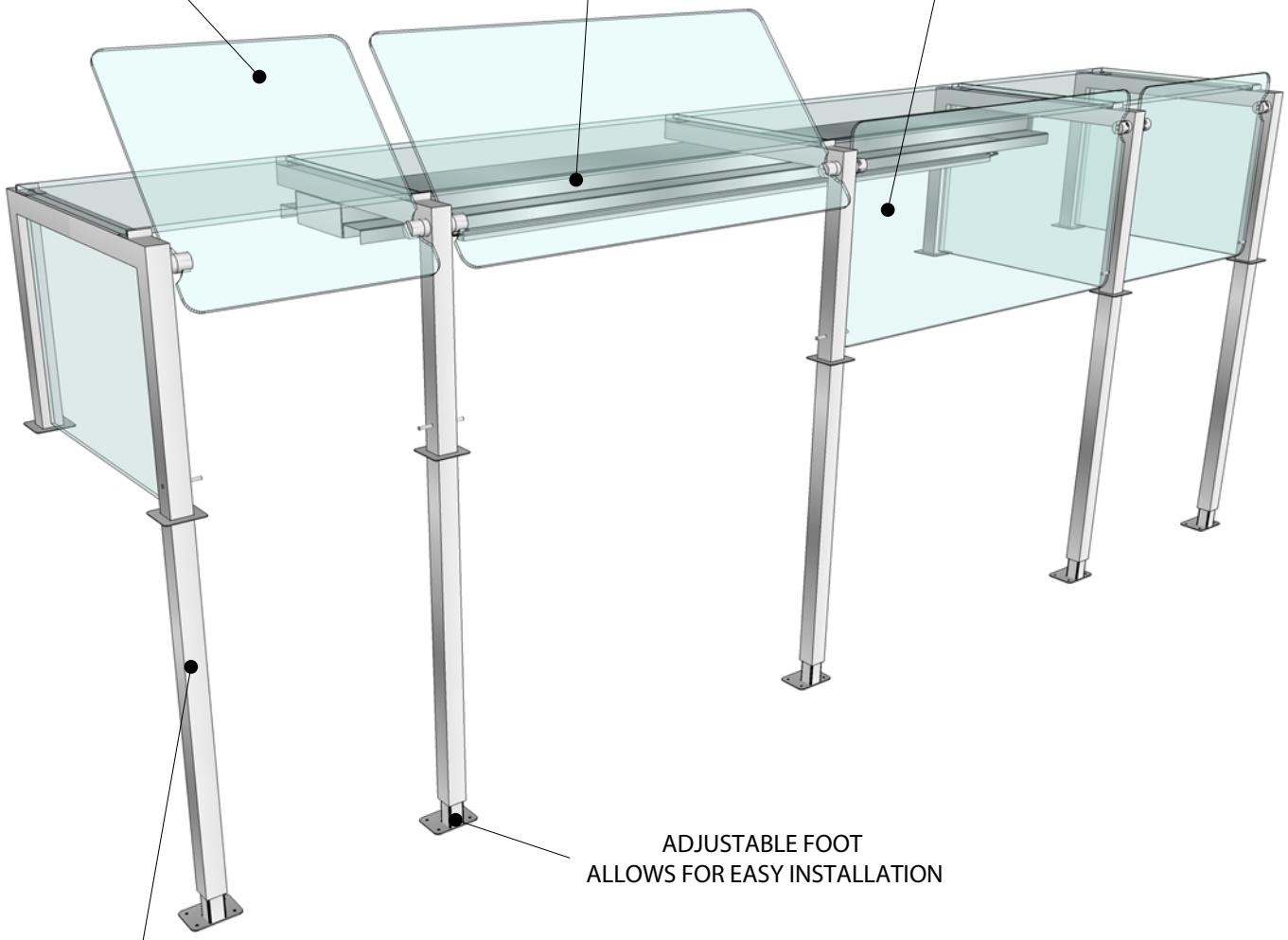
AVAILABLE IN OVERHEAD LED LIGHTING
OR OVERHEAD HEAT WITH LED LIGHTING
BOTH WITH STAINLESS STEEL SHROUD

GLASS SHOWN IN SELF-SERVICE POSITION

GLASS SHOWN IN SERVICE POSITION



ADJUSTABLE FOOT
ALLOWS FOR EASY INSTALLATION

FRONT SQUARE TUBING EXTENDS THROUGH COUNTERTOP
FOR ADDED STRENGTH AND INCREASED SPAN
(OPTIONAL SHORTER FRONT POSTS FOR SHORTER SPANS)

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

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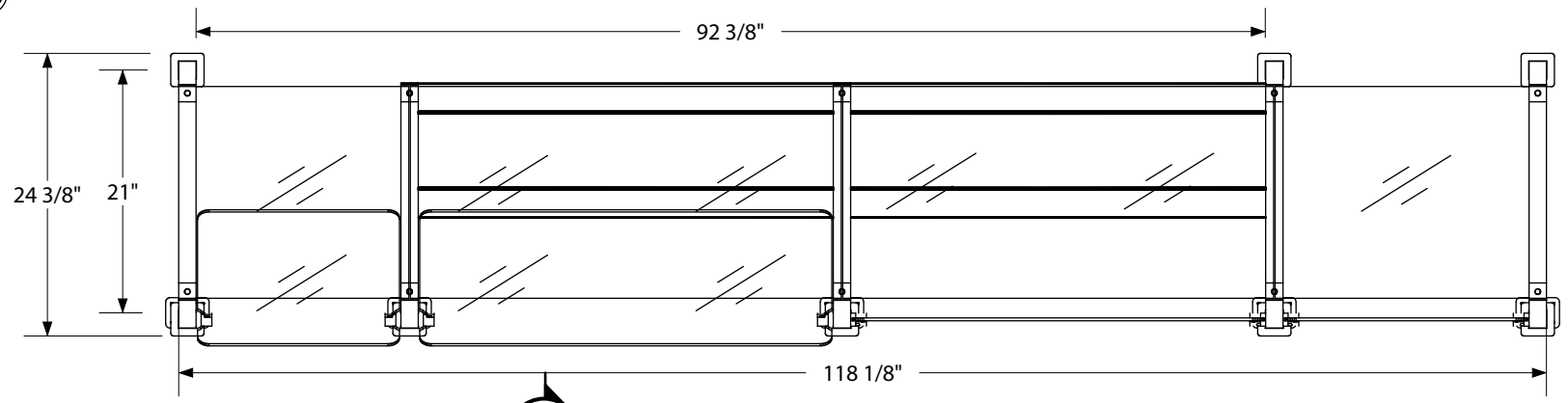
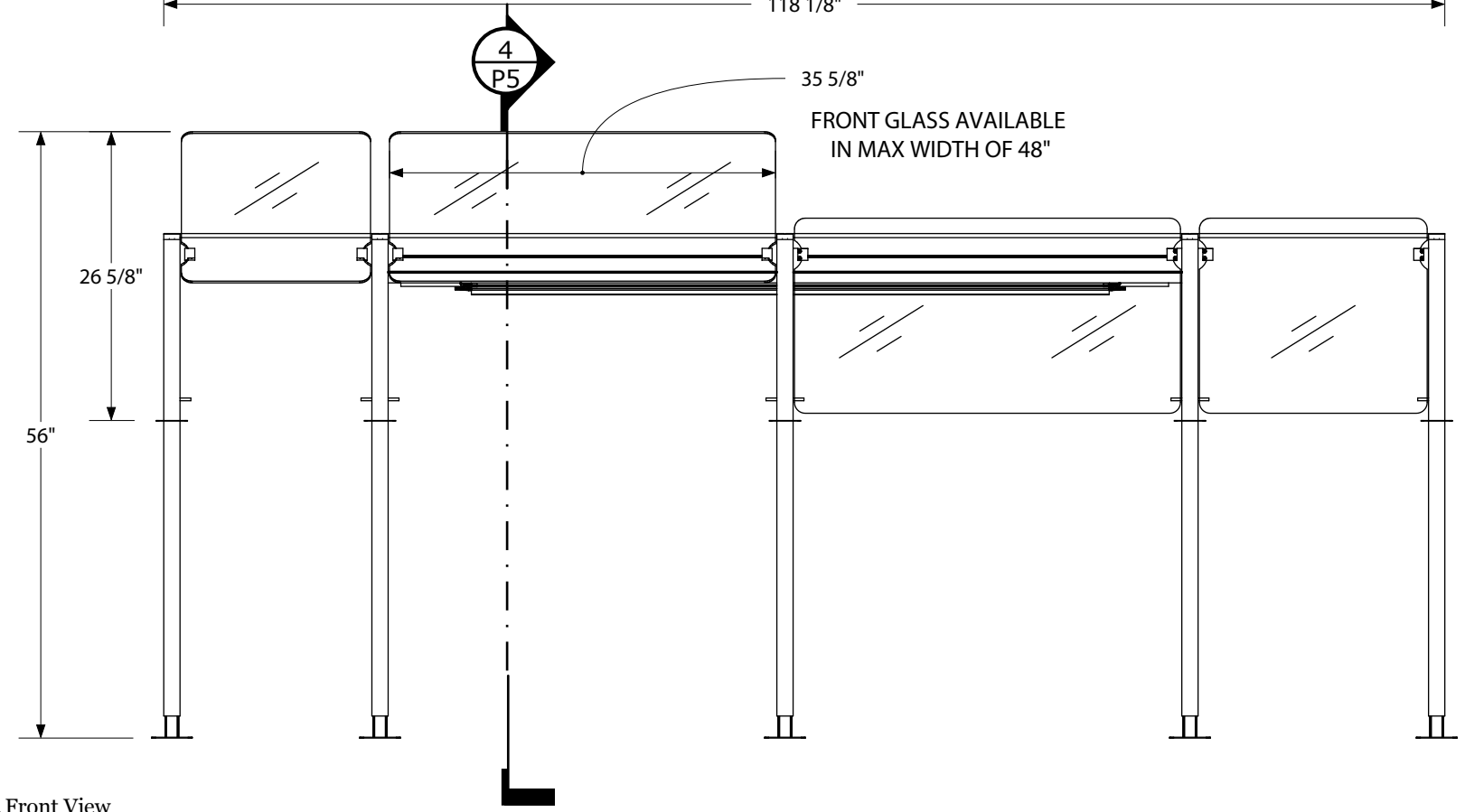
2 Plan View





3 Front View

CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

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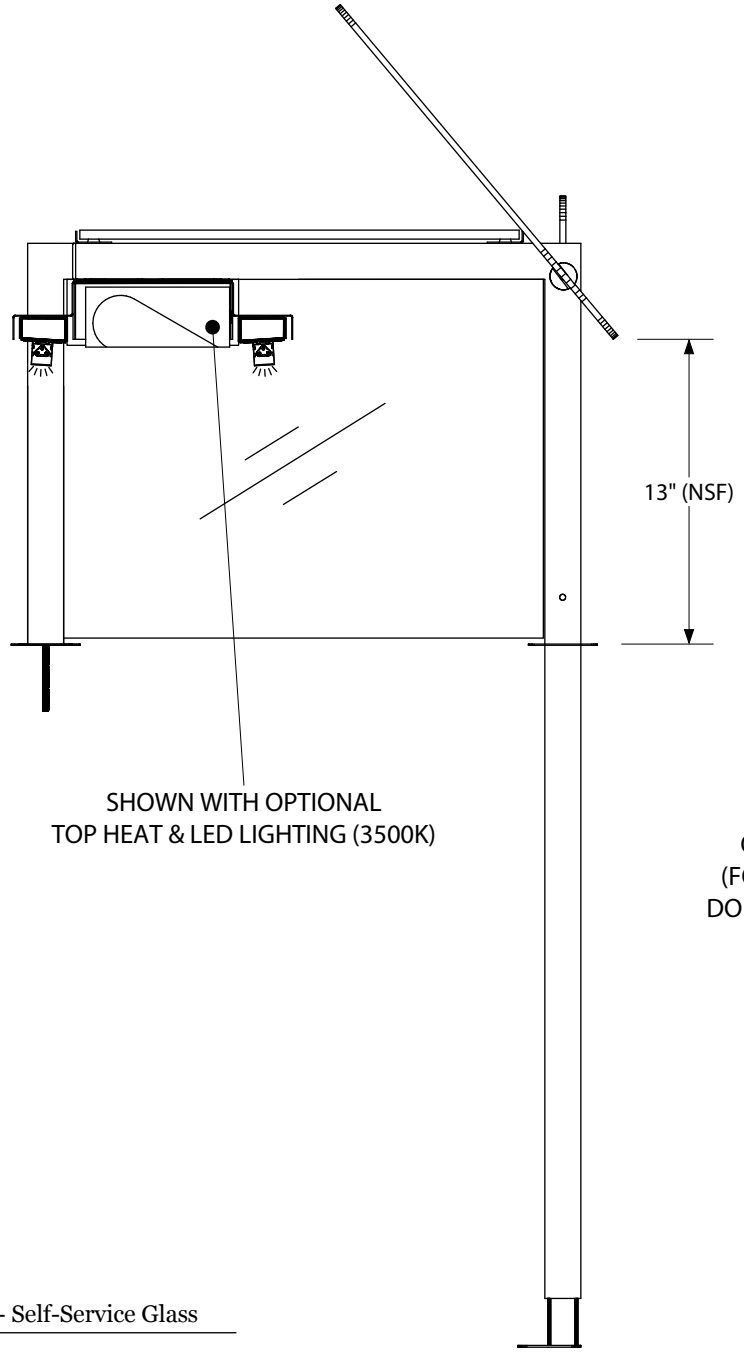

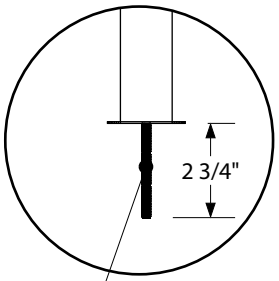

OPTIONAL BOLTED FRONT POST
(FOR SMALLER APPLICATIONS THAT
DO NOT REQUIRE A LARGE REAR SPAN)

4 Section View - Self-Service Glass

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CONVERTIBLE GUARD (CG)
SERVICE / SELF-SERVICE

REF. # 45429-03SIM

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Sheet No.
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Project #
45700-01

PIPER ELITE 500

Cashier Stand

The Elite 500 Cashier Stand is a comfortable workstation. Ideal for use in cafeteria/buffet lines. This Elite 500 unit is compatible and will interlock with other Elite 500 units or the cashier stand can be operated as a freestanding separate unit.

STANDARD FEATURES

- 14-gauge stainless steel top with 1-1/2" turndown on all sides
- Top secured by four recessed bolts for easy access
- 14-gauge stainless steel legs fastened to 18-gauge stainless steel bottom shelf
- 20-gauge stainless steel end and front panels are attached to legs
- Standard unit comes with a solid bottom
- Hole in top with bushing for cash register cord **(standard)**
- Locking drawer **(standard)**
- 5" diameter swivel plate casters, 2 with brakes
- Interlocking mechanism is provided to interlock with other Elite units
- The utility drawer is centered in the panel on the open side and mounted on roller bearing slides

JOB_____ ITEM # _____ QTY # _____

MODEL NUMBER

❑ 2-CD
- with drawer

❑ 2-CR
- corner unit

❑ 2-MCU
- mitered corner unit

Consult factory for unit specification on a corner or mitered unit.

DIMENSIONS

- 2-CD - with drawer - 36"H x 28"D x 30"L
- 2-CR - corner unit - 36"H x 28"D x 28"L
- 36" height on all standard units
- 30" height is available on Petite Elite units
- 28" width
- 30" length

COMMON OPTIONS

❑ **PIZZAZZ POWDER COATING IN LIEU OF STAINLESS STEEL**
❑ Tray slides
❑ Tubular foot rest
❑ Duplex outlet
❑ See reverse side for additional options

WARRANTY

One year parts and labor. Warranty is detailed on inside front cover of the price list.

SPEC A-11

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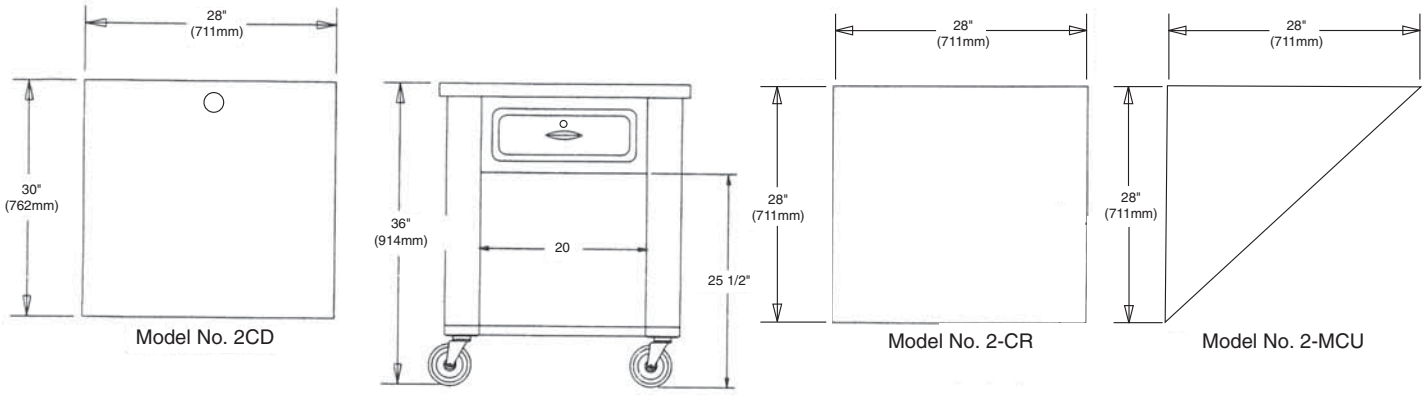
PIPER ELITE 500

Cashier Stand



OPTIONS / ACCESSORIES

	Part #	Description
❑	**PPC**	**Pizzazz Powder Coating**
❑	SRTS	Solid 3-ribbed tray slide, 16-gauge stainless steel
❑	3BTS	3-bar tray slide
❑	SSL	Legs in lieu of casters
❑	DOUT	Duplex outlet (120V, 15 AMP)
❑	FRMA	Formica laminate finish
❑	TFR	Tubular foot rest
❑	SKR	Skirting

CASHIER STAND UNIT SPECIFICATIONS

Model#	Length	Width	Height	Ship Wt. (lbs)
2-CD with drawer	30”	28”	36”	165
2-CR Corner unit	28”	28”	36”	160
Mitered Corner unit	–	28”	36”	140

Drawer is 16” wide, 19” long and 2-1/2” deep.

DIMENSION ADDITIONS FOR OPTIONS

- Add 12-3/4” to width for solid ribbed tray slide
- Add 12-1/2” to width for 3-bar tray slide
- 30” height is available on Petite Elite units

Note: Line-up drawing required when ordering a cashier stand or interconnected units.

A-11 SPEC

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