

PROJECT MANUAL
BID DOCUMENTS – April 8, 2022

HIGH SCHOOL
89 SANFORDVILLE ROAD
WARWICK, NEW YORK 10990

RENOVATIONS, FIELD WORK, ROOFING
AND EXTERIOR BATHROOM BUILDING
SED#44-21-01-06-7-041-001
SED#44-21-01-06-0-001-040

WARWICK VALLEY CENTRAL SCHOOL DISTRICT
225 West Street, Warwick, New York 10990
ORANGE COUNTY

EISENBACH AND RUHNKE ENGINEERING, P.C.
PROJECT NUMBER 05-21-04 & 05-20-06



THE ENGINEER THAT HAS SIGNED THIS DOCUMENT 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 CONSERVATION CONSTRUCTION CODE, CONSTRUCTION STANDARDS OF THE COMMISSIONER OF EDUCATION, NEW YORK STATE DEPARTMENT OF LABOR PART 56 OF TITLE 12, AND UNITED STATES ENVIRONMENTAL PROTECTION AGENCY ASBESTOS HAZARD EMERGENCY RESPONSE ACT REGULATIONS.

DIVISIONS 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 22, 23, 26, 28, 31, 32

EISENBACH AND RUHNKE ENGINEERING, P.C.

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PART 1 - GENERAL

1.01 DRAWING INDEX

- A. Drawings are listed on Cover Page for all work.
- B. Drawings are the property of the Engineer and shall not be used for any other purpose other than contemplated by the Drawings and Project Manual.

END OF LIST OF DRAWINGS

SECTION 00 1113
ADVERTISEMENT FOR BIDS

THE BOARD OF EDUCATION

1.01 INVITES BIDS FOR WARWICK VALLEY CSD – HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND EXTERIOR BATHROOM BUILDING

- A. Sealed bids will be received by the Board of Education, at the Warwick Valley Central School District until 2:00 PM on the 10th of May 2022 at which time they will be publicly opened and read aloud.
- B. Bidding Documents may be examined at the office of the Engineer, Eisenbach & Ruhnke Engineering, P.C., 291 Genesee Street, Utica, New York 13501, telephone 315.735.1916, fax 315.735.6365.
- C. For the convenience of prospective Bidders, subcontractors and material suppliers, Bidding Documents will also be on file at the following locations:
 - 1. Dodge Data & Analytics: <http://dodgeprojects.construction.com>
 - 2. Plan Room at www.erengpc.com
 - 3. Bidnet: <http://bidnetdirect.com/new-york>
- D. A pre-bid conference and on-site review of the Project areas will be conducted by the Engineer on April 27, 2022 commencing at 3:00 P.M. at the Warwick District Offices, 225 West Street, Warwick, NY 10990.
- E. Visits to the sites may be arranged by contacting Than Harrington (845)475-4311.
- F. Attention of the Bidder is particularly called to the Owner's sales tax exemption, the requirements as to conditions of employment to be observed and the minimum wage rates to be paid under the contract. In addition, the Bidding Documents for this project contain detailed requirements for the qualification of Bidders. These include, among other things, rigid bonding and insurance requirements, financial statements, bank references, lists of lawsuits, arbitrations, or other proceedings in which the Bidder has been named as a party, a statement of surety's intent to issue Performance and Payment Bonds, and a description of other projects of similar size and scope completed by the Bidder.
- G. Bids shall be prepared as set forth in "Instructions to Bidders", enclosed in a sealed envelope bearing on its face the name and address of the Bidder and the title of the Work to which the bid enclosed relates.
- H. Each Bidder shall deposit with its bid, security in an amount not less than five percent (5%) of the base bid in the form and subject to the conditions provided in the "Instructions to Bidders."
- I. No Bidder may withdraw its bid within forty-five (45) days after the actual bid opening.
- J. The Board of Education reserves the right to waive any and all informalities in or to reject any or all bids.
- K. The Owner further reserves its right to disqualify Bidders for any material failure to comply with the "Instructions to Bidders" and "Supplementary Instructions to Bidders."

DATE: _____

BY: SUSAN LAROE, DISTRICT CLERK

WARWICK VALLEY CENTRAL SCHOOL DISTRICT

END OF BID SOLICITATION

SECTION 00 2113
INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS APPLY TO THIS SECTION.

1.02 DOCUMENT INCLUDES

- A. Invitation
 - 1. Bid Submission
 - 2. Work Identified in the Contract Documents
 - 3. Contract Time
- B. Bid Documents and Contract Documents
 - 1. Definitions
 - 2. Contract Documents Identification
 - 3. Availability
 - 4. Examination
 - 5. Inquiries/Addenda
 - 6. Product/Assembly/System Substitutions
- C. Site Assessment
 - 1. Site Examination
 - 2. Prebid Conference
- D. Qualifications
 - 1. Qualifications
 - 2. Subcontractors/Suppliers/Others
- E. Bid Submission
 - 1. Bid Depository
 - 2. Submission Procedure
 - 3. Bid Ineligibility
- F. Bid Enclosures/Requirements
 - 1. Security Deposit
 - 2. Consent of Surety
 - 3. Performance Assurance
 - 4. Bid Form Requirements
 - 5. Bid Form Signature
 - 6. Insurance Certification
 - 7. Additional Bid Information
- G. Offer Acceptance/Rejection
 - 1. Duration of Offer
 - 2. Acceptance of Offer

1.03 RELATED DOCUMENTS

- A. Document 01 1000 - Summary of Contract(s).
- B. Document 00 1113 - Advertisement for Bids.
- C. Documents 00 4100 - Bid Form(s)
- D. Document 00 41 01 - Statement of Surety's Intent.
- E. Document 00 41 02 - Certificate of Non-Collusion.
- F. Document 00 4476 - Insurance Certification.
- F. Document 00 4546 - Certification Regarding the Iran Divestment Act
- G. Document 00 7300 - Supplementary Conditions

H. Document 00 7300A - Supplementary Conditions

INVITATION

2.01 BID SUBMISSION

- A. Bids signed and under seal, executed, and dated will be received at the office of the Warwick Valley Central School District at 225 West Street, Warwick, NY 10990 before 2:00 P.M. local standard time on the 10th day of May 2022.
- B. Offers submitted after the above time shall be returned to the bidder unopened.
- C. Offers will be opened publicly immediately after the time for receipt of bids.

2.02 LUMP SUM BIDS

- A. Bids will be received for the following Prime Contracts:
 - 1. Contract #1 – General Construction
 - 2. Contract #2 – Electrical
 - 3. Contract #3 – Plumbing
 - 4. Contract #4 – HVAC
 - 5. Contract #5 – Field Work and Irrigation
 - 6. Contract #6 – Roofing

2.03 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

- A. Work of this proposed Contract is as described in the specifications and on the drawings.
- B. Locations:
 - 1. High School, 89 Sanfordville Road, Warwick, NY 10990

2.04 CONTRACT TIME

- A. Owner requires that under the work of this contract be completed per the schedule provided in the Summary of Contracts.

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

2.06 CONTRACT DOCUMENTS IDENTIFICATION

- A. The Contract Documents are identified as E&R Project Number 05-21-04 and 05-21-06, High School Renovations, Field Work, Roofing and Exterior Bathroom Building as prepared by Eisenbach and Ruhnke Engineering, P.C. who is located at 291 Genesee Street, Utica, New York 13501, and with contents as identified in the Table of Contents.

2.07 AVAILABILITY

- A. Bid Documents may be obtained at the office of Eisenbach and Ruhnke Engineering, P.C. which is located at 291 Genesee Street, Utica, New York 13501.
- B. Bid Documents, on CD, in PDF format, will be available, at no cost, to all prospective bidders. The CD's will be available for a \$15 shipping fee if requested to be mailed.
- C. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

2.08 EXAMINATION

- A. Bid Documents may be viewed at the office of Eisenbach and Ruhnke Engineering, P.C.
- B. Bid Documents are on display at the offices of the following construction plan rooms:
 - 1. Dodge Data & Analytics: <http://dodgeprojects.construction.com>
 - 2. Bidnet: <<http://bidnetdirect.com/new-york>>
 - 3. Plan Room at ERENG.PC.COM.
- C. Upon receipt of Bid Documents verify that documents are complete. Notify Engineer should the documents be incomplete.

- D. Immediately notify Engineer upon finding discrepancies or omissions in the Bid Documents.

2.09 INQUIRIES/ADDENDA

- A. Direct questions to Jack Eisenbach, email: jeisenbach@erengpc.com and John Jouben jjouben@erengpc.com; Office number (315)735-1916. 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 2114, to the Engineer.
- B. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.
- C. Verbal answers are not binding on any party.
- D. Clarifications requested by bidders must be in writing not less than 7 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients.
- E. Answers: The Engineer will issue addenda, if necessary, to answer each question. Bidders shall rely on answers contained in such addenda and shall not rely upon any oral answers given by any employee or agent of Owner, Engineer, and Engineer's Consultants.

2.10 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 Engineer will not review any substitutions during the bidding period. The bidder assumes all responsibility to meet the requirements and the Engineer shall be final authority as to a product is equal to the specification.
- B. See Section 01 6000 - Product Requirements for additional requirements.

SITE ASSESSMENT

3.01 SITE EXAMINATION

- A. Bidders may inspect the site at the time of the pre-bid conference, if one is scheduled, or other times by advance agreement with the Owner. Bidders who do not inspect the site shall be nevertheless responsible for such information as might have been obtained from a reasonable site inspection.
- B. The bidder is required to contact Owner at the following address and phone number in order to arrange a date and time to visit the project site: Thank Harrington (845)475-4311.

3.02 PREBID CONFERENCE

- A. A bidders conference has been scheduled for 3:00 PM. on the 27th day of April, 2022 at the location of the Warwick Valley CSD District Offices, 225 West Street, Warwick, New York.
- B. Representatives of Eisenbach and Ruhnke Engineering, P.C. will be in attendance.
- C. Attendance is Non-Mandatory. Bidders are strongly advised to attend.
- D. Summarized minutes of this meeting will be circulated to attendees. These minutes will form part of the Contract Documents.
- E. Information relevant to the Bid Documents will be recorded in an Addendum, issued to Bid Document recipients.

QUALIFICATIONS

4.01 SUBCONTRACTORS/SUPPLIERS/OTHERS

- A. Owner reserves the right to reject a proposed subcontractor for reasonable cause.
- B. Refer to General Conditions.

BID SUBMISSION

5.01 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 provided, signed, and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name 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. Proposals must be submitted on the Form provided by the Engineer included in the project manual with all blanks appropriately filled in. They must be submitted in sealed envelopes bearing on the outside the name and address of the bidder title of the project and trade.
- E. To submit a bid for a bid package, the bidder should photocopy or remove the bid/proposal form for that bid package from the Project Manual. Then the bidder should complete, sign, and submit the form as required herein.
- F. 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. Additional copies of the Proposal Form will be furnished by the Engineer upon request.
 - 1. In case of a discrepancy between the words and figures, the written word, not the figures, will govern.
- G. Bidder's shall not rely on oral statements made by any employee or agent of the Owner, Engineer, Engineer's consultants or Owner's Representative. 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.
- H. No oral or telephonic proposals or modifications of proposals will be considered.

5.02 BID INELIGIBILITY

- A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.
- B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Owner, be declared unacceptable.
- C. Failure to provide security deposit, bonding or insurance requirements may, at the discretion of Owner, be waived.

BID ENCLOSURES/REQUIREMENTS

6.01 SECURITY DEPOSIT

- A. Bids shall be accompanied by a security deposit as follows:
 - 1. Bid Bond of a sum no less than 5 percent of the Bid Amount on AIA A310 Bid Bond Form or certified check, including alternates.
- B. Endorse the Bid Bond in the name of the Owner as obligee, signed and sealed by the principal (Contractor) and surety.
- C. The security deposit will be returned after delivery to the Owner 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 and other requested enclosures.
- F. If no contract is awarded, all security deposits will be returned.

6.02 CONSENT OF SURETY

- A. Submit with the Bid: Section 00 4101.

6.03 PERFORMANCE ASSURANCE

- A. Accepted Bidder: Provide a Performance and Payment bond as described in Document 00 7300 - Supplementary Conditions and the General Conditions. Prior to the execution of the Contract, the bidder to furnish bonds covering and 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 assurance bonds in the Bid Amount.

- C. The bidder shall require the attorney in fact who executes the required bonds on the 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.

6.04 INSURANCE

- A. Provide an executed Insurance form in Section 00 4476 stating their intention to provide insurance to the bidder in accordance with the insurance requirements of the Contract Documents.

6.05 BID FORM REQUIREMENTS

- A. Complete all requested information in the Bid Form and Appendices.

6.06 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 documents this status as requested.

6.07 FEES FOR CHANGES IN THE WORK

- A. Refer to General Conditions.

6.08 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.

6.09 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 more 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 prior to award of the contract, what kind, type, brand, or manufacture is included in the base bid for 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 required by the Owner. Contractor shall refer to Section 01 6000.

6.10 NON DISCRIMINATION

- 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.

6.11 PREVAILING WAGES

- A. Law required the payment of prevailing wages on the project, as listed in Section 00 4343.

6.12 ADDITIONAL BID INFORMATION

- A. Submit the following Supplements concurrent with bid submission.
 - 1. Section 00 4101 - Statement of Surety's Intent
 - 2. Section 00 4102 - Certificate of Non-Collusion
 - 3. Section 00 4336 - Proposed Subcontractors Form
 - 4. Section 00 4430 - Hold Harmless Agreement
 - 5. Section 00 4476 - Insurance Certification
 - 6. Section 00 4546 - Certification Regarding the Iran Divestment Act

OFFER ACCEPTANCE/REJECTION

7.01 ACCEPTANCE OF OFFER

- A. Owner reserves the right to accept or reject any or all offers.
- B. The bidder acknowledges the right of the Owner 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 or if the bid is incomplete or irregular.
- C. After acceptance by Owner, Engineer on behalf of Owner, will issue to the successful bidder, a written Bid Acceptance.

7.02 POST-BID PROCEDURE

- A. The bid proposal, alternates, and the proposed subcontractors. Information received from owners of other projects all will be considered to determine whether the contractor is the "lowest responsible bidder" in making the award. The Owner and Engineer 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.
- B. When requested by the Owner, bidders shall furnish all information and data required by the Owner within the time and in the form and manner requested by the Owner. Upon notification from the Owner, the apparent low bidder shall furnish, within three (3) 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 the milestones and phasing plan.
 - h. The insurance certificates required by the Bid Documents.
 - i. A proposed schedule of values for the bidder's work.
 - j. 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 will designate a time and place for the meeting between the Owner and Engineer 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 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 specified by the Owner, as set forth in of 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 is not submitted or fails to satisfy the Owner that the bidder is responsible, able and qualified to carry out the obligations of the 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.
7. In the event that the Owner should reject the proposal of the bidder, the Owner may elect to meet with the next lowest bidder and to consider the information as provided above. In the event that the proposal of the next lowest bidder is rejected, the Owner may elect to meet with the third lowest bidder and repeat the above process. At all times the Owner retains the right to reject all bids.

END OF SECTION

DRAFT AIA® Document A701™ – 2018

Instructions to Bidders

for the following Project:

(Name, location, and detailed description)

<< >>
<< >>
<< >>

THE OWNER:

(Name, legal status, address, and other information)

<< >>< >>
<< >>
<< >>
<< >>

THE ARCHITECT:

(Name, legal status, address, and other information)

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ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™-2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

« »

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper

documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

« »

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

« »

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

« »

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning « » days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

« »

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:

(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

« »

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

« »

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

« »

- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

« »

- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

« »

- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013.)

« »

- .5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[☐] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

<< >>

[☐] The Sustainability Plan:

Title	Date	Pages

[☐] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:

(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

<< >>

SECTION 00 2114

RFI FORM

CONTRACTOR'S REQUEST FOR INFORMATION NO. _____

E&R RFI NO: _____

NAME OF PROJECT:

**WARWICK VALLEY CSD HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND
EXTERIOR BATHROOM BUILDING**

NAME OF OWNER: Warwick Valley Central School District

A/E PROJECT NO: 05-21-04 and 05-21-06

- A. ENGINEER: Eisenbach and Ruhnke Engineering, P.C.
291 Genesee Street
Utica, New York 13501

Phone: 315.735.1916 Fax: 315.735.6365 Email: Jack Eisenbach jeisenbach@erengpc.com John Jouben
jjouben@erengpc.com and Angela Correll acorrell@erengpc.com

- B. FROM (CO. NAME): _____

DATE: _____

EMAIL/FAX NO. _____

CONTACT NAME: _____

SUBJECT: _____

DISCIPLINE/TRADE: _____

DWG./SPEC. REFERENCE: _____

QUESTION:

RESPONSE:

ENGINEER'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 4100.1

BID FORM – CONTRACT #1 GENERAL CONSTRUCTION

THE PROJECT AND THE PARTIES

TO:

Warwick Valley Central School District
225 West Street Ext.
Warwick, NY 10990

FOR:

**HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND EXTERIOR
BATHROOM BUILDING**

CONTRACT #1 – GENERAL CONSTRUCTION

ENGINEER'S PROJECT NUMBER: 05-21-04 and 05-20-06

DATE: _____ (BIDDER TO ENTER DATE)

SUBMITTED BY:

Bidder's Full Name _____

Address _____

City, State, Zip _____

Contact Name _____ Phone _____

1.01 OFFER

- A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Eisenbach and Ruhnke Engineering, P.C. for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform General Construction for the Sum of:

B. BASE BID

1. The Base Bid of this proposal for all work required by the Contract Documents for Contract #1 is as follows:

(\$ _____) DOLLARS

C. ALLOWANCE(S)

1. The Total Allowance as indicated in Section 01 2100 - Allowances is as follows:

(\$ _____) DOLLARS

D. TOTAL BID

1. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #1 General Construction is as follows:

(\$ _____) DOLLARS

(The Total Base Bid is sum of 1.01.B1 and 1.01.C.1)

- E. The undersigned further understands and agrees that he is to furnish and provide all 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 are accepted by the Owner.

- F. All Allowances described in Section 01 2100 are included in Bid Sum.
- G. We have included the required security deposit as required by the Instruction to Bidders.
- H. All applicable federal taxes are included, and State of New York taxes are included in the Bid Sum.

1.02 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 Warwick Valley CSD within the time period stated above, the Contractor will:
 - 1. Execute the Agreement within seven days of receipt of Notice of Award.
 - 2. Furnish the required bonds within seven days of receipt of Notice of Award.
- C. If this bid is accepted within the time stated, and the Contractor fails to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Warwick Valley CSD by reason of the Contractor's 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.

1.03 REJECTION OF BIDS

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

1.04 CONTRACT TIME

- A. If this Bid is accepted, the Contractor 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 Section 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in damages being assessed as stated in the Bidding Requirements.

1.05 CHANGES TO THE WORK

- A. Refer to General Conditions.

1.06 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 _____.

1.07 BID FORM SUPPLEMENTS

- A. The following information is included with Bid submission:
 - 1. Document 00 4101 - Statement of Surety's Intent.
 - 2. Document 00 4336 - List of Subcontractors
 - 3. Document 00 4430 - Hold Harmless Agreement.
 - 4. Document 00 4546 - Certification Regarding the Iran Disinvestment Act
 - 5. Document 00 4476 - Insurance Certification.
 - 6. Section 00 6000 - Project Forms Bid Bond.

1.08 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.

1.09 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 Warwick Valley CSD upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Warwick Valley CSD
 - 4. That no member of the Warwick Valley CSD or any officer or employee of the Warwick Valley CSD or person whose salary is payable in whole or in part from the Warwick Valley CSD 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: _____

SECTION 00 4100.2

BID FORM – CONTRACT #2 ELECTRICAL

THE PROJECT AND THE PARTIES

TO:

Warwick Valley Central School District
225 West Street Ext.
Warwick, NY 10990

FOR:

**HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND EXTERIOR
BATHROOM BUILDING**
CONTRACT #2 – ELECTRICAL
ENGINEER'S PROJECT NUMBER: 05-21-04 and 05-20-06

DATE: _____ (BIDDER TO ENTER DATE)

SUBMITTED BY:

Bidder's Full Name _____
Address _____
City, State, Zip _____
Contact Name _____ Phone _____

1.01 OFFER

A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Eisenbach and Ruhnke Engineering, P.C. for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Electrical Construction for the Sum of:

B. BASE BID

1. The Base Bid of this proposal for all work required by the Contract Documents for Contract #2 is as follows:

(\$ _____) DOLLARS

C. ALLOWANCE(S)

1. The Total Allowance as indicated in Section 01 2100 - Allowances is as follows:

(\$ _____) DOLLARS

D. TOTAL BID

1. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #2 is as follows:

(\$ _____) DOLLARS

(The Total Base Bid is sum of 1.01.B1 and 1.01.C.1)

E. The undersigned further understands and agrees that he is to furnish and provide all 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 are accepted by the Owner.

- F. All Allowances described in Section 01 2100 are included in Bid Sum.
- G. We have included the required security deposit as required by the Instruction to Bidders.
- H. All applicable federal taxes are included, and State of New York taxes are included in the Bid Sum.

1.02 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 Warwick Valley CSD within the time period stated above, the Contractor will:
 - 1. Execute the Agreement within seven days of receipt of Notice of Award.
 - 2. Furnish the required bonds within seven days of receipt of Notice of Award.
- C. If this bid is accepted within the time stated, and the Contractor fails to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Warwick Valley CSD by reason of the Contractor's 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.

1.03 REJECTION OF BIDS

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

1.04 CONTRACT TIME

- A. If this Bid is accepted, the Contractor 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 Section 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in damages being assessed as stated in the Bidding Requirements.

1.05 CHANGES TO THE WORK

- A. Refer to General Conditions.

1.06 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 _____.

1.07 BID FORM SUPPLEMENTS

- A. The following information is included with Bid submission:
 - 1. Document 00 4101 - Statement of Surety's Intent.
 - 2. Document 00 4336 - List of Subcontractors
 - 3. Document 00 4430 - Hold Harmless Agreement.
 - 4. Document 00 4546 - Certification Regarding the Iran Disinvestment Act
 - 5. Document 00 4476 - Insurance Certification.
 - 6. Section 00 6000 - Project Forms Bid Bond.

1.08 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.

1.09 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 Warwick Valley CSD upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Warwick Valley CSD
 - 4. That no member of the Warwick Valley CSD or any officer or employee of the Warwick Valley CSD or person whose salary is payable in whole or in part from the Warwick Valley CSD 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: _____

SECTION 00 4100.3

BID FORM – CONTRACT #3 PLUMBING

THE PROJECT AND THE PARTIES

TO:

Warwick Valley Central School District
225 West Street Ext.
Warwick, NY 10990

FOR:

**HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND EXTERIOR
BATHROOM BUILDING**

CONTRACT #3 – PLUMBING

ENGINEER'S PROJECT NUMBER: 05-21-04 and 05-20-06

DATE: _____ (BIDDER TO ENTER DATE)

SUBMITTED BY:

Bidder's Full Name _____

Address _____

City, State, Zip _____

Contact Name _____ Phone _____

1.01 OFFER

- A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Eisenbach and Ruhnke Engineering, P.C. for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Plumbing Construction for the Sum of:

B. BASE BID

1. The Base Bid of this proposal for all work required by the Contract Documents for Contract #3 is as follows:

(\$ _____) DOLLARS

C. ALLOWANCE(S)

1. The Total Allowance as indicated in Section 01 2100 - Allowances is as follows:

(\$ _____) DOLLARS

D. TOTAL BID

1. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #3 is as follows:

(\$ _____) DOLLARS

(The Total Base Bid is sum of 1.01.B1 and 1.01.C.1)

- E. The undersigned further understands and agrees that he is to furnish and provide all 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 are accepted by the Owner.

- F. All Allowances described in Section 01 2100 are included in Bid Sum.
- G. We have included the required security deposit as required by the Instruction to Bidders.
- H. All applicable federal taxes are included, and State of New York taxes are included in the Bid Sum.

1.02 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 Warwick Valley CSD within the time period stated above, the Contractor will:
 - 1. Execute the Agreement within seven days of receipt of Notice of Award.
 - 2. Furnish the required bonds within seven days of receipt of Notice of Award.
- C. If this bid is accepted within the time stated, and the Contractor fails to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Warwick Valley CSD by reason of the Contractor's 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.

1.03 REJECTION OF BIDS

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

1.04 CONTRACT TIME

- A. If this Bid is accepted, the Contractor 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 Section 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in damages being assessed as stated in the Bidding Requirements.

1.05 CHANGES TO THE WORK

- A. Refer to General Conditions.

1.06 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 _____.

1.07 BID FORM SUPPLEMENTS

- A. The following information is included with Bid submission:
 - 1. Document 00 4101 - Statement of Surety's Intent.
 - 2. Document 00 4336 - List of Subcontractors
 - 3. Document 00 4430 - Hold Harmless Agreement.
 - 4. Document 00 4546 - Certification Regarding the Iran Disinvestment Act
 - 5. Document 00 4476 - Insurance Certification.
 - 6. Section 00 6000 - Project Forms Bid Bond.

1.08 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.

1.09 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 Warwick Valley CSD upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Warwick Valley CSD
 - 4. That no member of the Warwick Valley CSD or any officer or employee of the Warwick Valley CSD or person whose salary is payable in whole or in part from the Warwick Valley CSD 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: _____

SECTION 00 4100.4

BID FORM – CONTRACT #4 HVAC

THE PROJECT AND THE PARTIES

TO:

Warwick Valley Central School District
225 West Street Ext.
Warwick, NY 10990

FOR:

**HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND EXTERIOR
BATHROOM BUILDING**

CONTRACT #4 – HVAC

ENGINEER'S PROJECT NUMBER: 05-21-04 and 05-20-06

DATE: _____ (BIDDER TO ENTER DATE)

SUBMITTED BY:

Bidder's Full Name _____

Address _____

City, State, Zip _____

Contact Name _____ Phone _____

1.01 OFFER

- A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Eisenbach and Ruhnke Engineering, P.C. for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform HVAC Construction for the Sum of:

B. BASE BID

1. The Base Bid of this proposal for all work required by the Contract Documents for Contract #4 is as follows:

(\$ _____) DOLLARS

C. ALLOWANCE(S)

1. The Total Allowance as indicated in Section 01 2100 - Allowances is as follows:

(\$ _____) DOLLARS

D. TOTAL BID

1. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #4 is as follows:

(\$ _____) DOLLARS

(The Total Base Bid is sum of 1.01.B1 and 1.01.C.1)

- E. The undersigned further understands and agrees that he is to furnish and provide all 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 are accepted by the Owner.

- F. All Allowances described in Section 01 2100 are included in Bid Sum.
- G. We have included the required security deposit as required by the Instruction to Bidders.
- H. All applicable federal taxes are included, and State of New York taxes are included in the Bid Sum.

1.02 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 Warwick Valley CSD within the time period stated above, the Contractor will:
 - 1. Execute the Agreement within seven days of receipt of Notice of Award.
 - 2. Furnish the required bonds within seven days of receipt of Notice of Award.
- C. If this bid is accepted within the time stated, and the Contractor fails to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Warwick Valley CSD by reason of the Contractor's 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.

1.03 REJECTION OF BIDS

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

1.04 CONTRACT TIME

- A. If this Bid is accepted, the Contractor 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 Section 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in damages being assessed as stated in the Bidding Requirements.

1.05 CHANGES TO THE WORK

- A. Refer to General Conditions.

1.06 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 _____.

1.07 BID FORM SUPPLEMENTS

- A. The following information is included with Bid submission:
 - 1. Document 00 4101 - Statement of Surety's Intent.
 - 2. Document 00 4336 - List of Subcontractors
 - 3. Document 00 4430 - Hold Harmless Agreement.
 - 4. Document 00 4546 - Certification Regarding the Iran Disinvestment Act
 - 5. Document 00 4476 - Insurance Certification.
 - 6. Section 00 6000 - Project Forms Bid Bond.

1.08 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.

1.09 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 Warwick Valley CSD upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Warwick Valley CSD
 - 4. That no member of the Warwick Valley CSD or any officer or employee of the Warwick Valley CSD or person whose salary is payable in whole or in part from the Warwick Valley CSD 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: _____

SECTION 00 4100.5

BID FORM – CONTRACT #5 FIELDS AND IRRIGATION

THE PROJECT AND THE PARTIES

TO:

Warwick Valley Central School District
225 West Street Ext.
Warwick, NY 10990

FOR:

**HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND EXTERIOR
BATHROOM BUILDING**

CONTRACT #5 – FIELDS AND IRRIGATION

ENGINEER'S PROJECT NUMBER: 05-21-04 and 05-20-06

DATE: _____ (BIDDER TO ENTER DATE)

SUBMITTED BY:

Bidder's Full Name _____
Address _____
City, State, Zip _____
Contact Name _____ Phone _____

1.01 OFFER

A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Eisenbach and Ruhnke Engineering, P.C. for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Field Work for the Sum of:

B. BASE BID

1. The Base Bid of this proposal for all work required by the Contract Documents for Contract #5 is as follows:

(\$ _____) DOLLARS

C. ALLOWANCE(S)

1. The Total Allowance as indicated in Section 01 2100 - Allowances is as follows:

(\$ _____) DOLLARS

D. TOTAL BID

1. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #5 is as follows:

(\$ _____) DOLLARS

(The Total Base Bid is sum of 1.01.B1 and 1.01.C.1)

E. The undersigned further understands and agrees that he is to furnish and provide all 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 are accepted by the Owner.

- F. All Allowances described in Section 01 2100 are included in Bid Sum.
- G. We have included the required security deposit as required by the Instruction to Bidders.
- H. All applicable federal taxes are included, and State of New York taxes are included in the Bid Sum.

1.02 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 Warwick Valley CSD within the time period stated above, the Contractor will:
 - 1. Execute the Agreement within seven days of receipt of Notice of Award.
 - 2. Furnish the required bonds within seven days of receipt of Notice of Award.
- C. If this bid is accepted within the time stated, and the Contractor fails to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Warwick Valley CSD by reason of the Contractor's 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.

1.03 REJECTION OF BIDS

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

1.04 CONTRACT TIME

- A. If this Bid is accepted, the Contractor 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 Section 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in damages being assessed as stated in the Bidding Requirements.

1.05 CHANGES TO THE WORK

- A. Refer to General Conditions.

1.06 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 _____.

1.07 BID FORM SUPPLEMENTS

- A. The following information is included with Bid submission:
 - 1. Document 00 4101 - Statement of Surety's Intent.
 - 2. Document 00 4336 - List of Subcontractors
 - 3. Document 00 4430 - Hold Harmless Agreement.
 - 4. Document 00 4546 - Certification Regarding the Iran Disinvestment Act
 - 5. Document 00 4476 - Insurance Certification.
 - 6. Section 00 6000 - Project Forms Bid Bond.

1.08 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.

1.09 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 Warwick Valley CSD upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Warwick Valley CSD
 4. That no member of the Warwick Valley CSD or any officer or employee of the Warwick Valley CSD or person whose salary is payable in whole or in part from the Warwick Valley CSD 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: _____

SECTION 00 4100.6

BID FORM – CONTRACT #6 ROOFING

THE PROJECT AND THE PARTIES

TO:

Warwick Valley Central School District
225 West Street Ext.
Warwick, NY 10990

FOR:

**HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND EXTERIOR
BATHROOM BUILDING**

CONTRACT #6 – ROOFING

ENGINEER'S PROJECT NUMBER: 05-21-04 and 05-20-06

DATE: _____ (BIDDER TO ENTER DATE)

SUBMITTED BY:

Bidder's Full Name _____

Address _____

City, State, Zip _____

Contact Name _____ Phone _____

1.01 OFFER

- A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Eisenbach and Ruhnke Engineering, P.C. for the above-mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform Roofing Construction for the Sum of:

B. BASE BID

1. The Base Bid of this proposal for all work required by the Contract Documents for Contract #6 is as follows:

(\$ _____) DOLLARS

C. ALLOWANCE(S)

1. The Total Allowance as indicated in Section 01 2100 - Allowances is as follows:

(\$ _____) DOLLARS

D. TOTAL BID

1. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract #6 is as follows:

(\$ _____) DOLLARS

(The Total Base Bid is sum of 1.01.B1 and 1.01.C.1)

- E. The undersigned further understands and agrees that he is to furnish and provide all 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 are accepted by the Owner.

- F. All Allowances described in Section 01 2100 are included in Bid Sum.
- G. We have included the required security deposit as required by the Instruction to Bidders.
- H. All applicable federal taxes are included, and State of New York taxes are included in the Bid Sum.

1.02 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 Warwick Valley CSD within the time period stated above, the Contractor will:
 - 1. Execute the Agreement within seven days of receipt of Notice of Award.
 - 2. Furnish the required bonds within seven days of receipt of Notice of Award.
- C. If this bid is accepted within the time stated, and the Contractor fails to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Warwick Valley CSD by reason of the Contractor's 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.

1.03 REJECTION OF BIDS

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

1.04 CONTRACT TIME

- A. If this Bid is accepted, the Contractor 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 Section 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in damages being assessed as stated in the Bidding Requirements.

1.05 CHANGES TO THE WORK

- A. Refer to General Conditions.

1.06 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 _____.

1.07 BID FORM SUPPLEMENTS

- A. The following information is included with Bid submission:
 - 1. Document 00 4101 - Statement of Surety's Intent.
 - 2. Document 00 4336 - List of Subcontractors
 - 3. Document 00 4430 - Hold Harmless Agreement.
 - 4. Document 00 4546 - Certification Regarding the Iran Disinvestment Act
 - 5. Document 00 4476 - Insurance Certification.
 - 6. Section 00 6000 - Project Forms Bid Bond.

1.08 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.

1.09 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 Warwick Valley CSD upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Warwick Valley CSD
 - 4. That no member of the Warwick Valley CSD or any officer or employee of the Warwick Valley CSD or person whose salary is payable in whole or in part from the Warwick Valley CSD 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: _____

SECTION 00 4101
STATEMENT OF SURETY'S INTENT

TO: _____
(OWNER)

We have reviewed the Bid of _____
(Contractor)

OF _____
(Address)

FOR _____
(Project)

BIDS FOR WHICH WILL BE RECEIVED ON _____ (BID OPENING DATE), AND WISH TO ADVISE THAT SHOULD THIS BID OF THE CONTRACTOR BE ACCEPTED AND THE CONTRACT AWARDED TO HIM IT IS OUR PRESENT INTENTION TO BECOME SURETY ON THE PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND REQUIRED BY THE CONTRACT.

Any arrangement for the Bonds required by the Contract is a matter between the Contractor and ourselves and we assume no liability to you or third parties if for any reason we do not execute the requisite Bonds.

We are duly licensed to sell surety bonds in the State of New York.

ATTEST:

Surety's Authorized Signature(s)

ATTACH POWER OF ATTORNEY

(CORPORATE SEAL, IF ANY. IF NO SEAL, WRITE "NO SEAL" ACROSS THIS PLACE AND SIGN)

(THIS FORM MUST BE COMPLETED AND SUBMITTED WITH THE BID)

END OF SECTION

SECTION 00 4102
CERTIFICATE OF NON-COLLUSION

TO _____, IN ACCORDANCE WITH SEALED BIDS FOR

WARWICK VALLEY CSD
HIGH SCHOOL
RENOVATIONS, FIELD WORK, ROOFING AND EXTERIOR BATHROOM BUILDING

SUBMITTED UNDER DATE OF _____ SECTION 103D OF THE
GENERAL MUNICIPAL LAW, AS AMENDED, THE BIDDER CERTIFIES THAT:

- A. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization under penalty of perjury, that to the best of their knowledge and belief:
- B. 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;
- C. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and
- D. 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.

COMPANY: _____

BY: _____

Representative

END OF SECTION

SECTION 00 4336
PROPOSED SUBCONTRACTORS FORM

PARTICULARS

1.01 HEREWITH IS THE LIST OF SUBCONTRACTORS REFERENCED IN THE BID SUBMITTED BY:

(BIDDER) _____

1.02 TO (OWNER): WARWICK VALLEY CENTRAL SCHOOL DISTRICT

DATED _____ AND WHICH IS AN INTEGRAL PART OF THE BID FORM.

1.03 THE FOLLOWING WORK WILL BE PERFORMED (OR PROVIDED) BY SUBCONTRACTORS AND COORDINATED BY US:

LIST OF SUBCONTRACTORS

- A. COMPANY NAME: _____
CONTACT NAME/EMAIL: _____
CONTACT NUMBER: _____
- B. COMPANY NAME: _____
CONTACT NAME/EMAIL: _____
CONTACT NUMBER: _____
- C. COMPANY NAME: _____
CONTACT NAME/EMAIL: _____
CONTACT NUMBER: _____
- D. COMPANY NAME: _____
CONTACT NAME/EMAIL: _____
CONTACT NUMBER: _____

END OF SECTION

SECTION 00 4343
PREVAILING WAGE RATES

PART ONE

1.01 RELATED DOCUMENTS

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

1.02 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 statutes ordinances, codes, rules and regulations and orders which are applicable to the performance of this contract. The Contractor shall likewise require all subcontractors 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. 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



Kathy Hochul, Governor

Roberta Reardon, Commissioner

Warwick Valley CSD

Jack Eisenbach, President
Eisenbach & Ruhnke Engineering
291 Genesee Street
Utica NY 13501

Schedule Year 2021 through 2022
Date Requested 02/03/2022
PRC# 2022001196

Location 89 Sanfordville Road
Project ID#
Project Type High School Renovation, Field Work and Exterior Bathroom Building

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Wage Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2021 through June 2022. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

SECTION 00 4430

HOLD HARMLESS AGREEMENT

HEREIN THE "CONTRACTOR"
ASSUMES RESPONSIBILITY FOR ANY AND ALL INJURY TO OR DEATH OF ANY AND ALL PERSONS, 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 SCHOOL DISTRICT, AND THE (ENGINEER/ARCHITECT) EISENBACH AND RUHNKE ENGINEERING, P.C. 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 THERE FROM, 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

IN THE PRESENCE OF:

BY:

END OF SECTION

SECTION 00 4476
INSURANCE CERTIFICATION

BID OR PROJECT NO. # _____

NAME OF PROJECT: HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND EXTERIOR BATHROOM BUILDING

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: _____

Are you an agent for the companies providing the coverage?

Yes _____ No _____

DATE: _____

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 Warwick Valley Central School District will reject my bid and award to the next lowest bidder.

FIRM NAME:

ADDRESS:

DATE: _____

Bidder’s Signature: _____

END OF SECTION

SECTION 00 4546

CERTIFICATION REGARDING THE IRAN DIVESTMENT ACT

**WARWICK VALLEY CSD HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND
EXTERIOR BATHROOM BUILDING**

1.01 CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

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

I, _____, being duly sworn, deposes and says that he/she is the _____ of the _____ Corporation and that neither the Bidder/ Contractor nor any proposed subcontractor is identified on the Prohibited Entities List.

SIGNED

SWORN to before me this _____ day of _____ 202____

Notary Public: _____

OR

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

**WARWICK VALLEY CSD HIGH SCHOOL – RENOVATIONS, FIELD WORK, ROOFING AND
EXTERIOR BATHROOM BUILDING**

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: _____

END OF SECTION

SECTION 00 5000
CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

**1.01 CONTRACTOR IS RESPONSIBLE FOR OBTAINING A VALID LICENSE TO USE ALL
COPYRIGHTED DOCUMENTS SPECIFIED BUT NOT INCLUDED IN THE PROJECT MANUAL.**

1.02 AGREEMENT AND CONDITIONS OF THE CONTRACT

- A. See Section 00 5200 - Agreement Form for the Agreement form to be executed.
- B. See Section 00 7200 - General Conditions for the General Conditions.
- C. See Section 00 7300 - Supplementary Conditions for the Supplementary Conditions.
- D. The Agreement is based on AIA A101-2017.
- E. The General Conditions are based on AIA A201-2017.

1.03 FORMS

- A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the Contract Documents.
- B. Bond Forms:
 - 1. Bid Bond Form: AIA A310.
 - 2. Performance and Payment Bond Form: AIA A312.
- C. Clarification and Modification Forms:
 - 1. Engineer's Supplemental Instructions Form: AIA G710-2017.
 - 2. Construction Change Directive Form: AIA G714-2017.
 - 3. Change Order Form: AIA G701.
- D. Closeout Forms:
 - 1. Certificate of Substantial Completion Form: AIA G704.

1.04 REFERENCE STANDARDS

- A. AIA A101-2007 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum; 2007.
- B. AIA A201- General Conditions of the Contract for Construction; 2017.
- C. AIA A310 - Bid Bond; 2010.
- D. AIA A312 - Performance Bond and Payment Bond; 2010.
- E. AIA G701 - Change Order; 2017.
- F. AIA G704 - Certificate of Substantial Completion; 2017.
- G. AIA G710- Engineer's Supplemental Instructions; 2017.
- H. AIA G710 - Engineer's Supplemental Instructions; 2017.
- I. AIA G714- Construction Change Directive; 2017.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 5200
AGREEMENT FORM

PART 1 GENERAL

1.01 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.

1.01 FORM OF AGREEMENT

- A. The agreement to be executed is attached following this page.

1.03 RELATED REQUIREMENTS

- A. Section 00 7200 - General Conditions.
- B. Section 00 7300 and 00 7300A - Supplementary Conditions.
- C. Section 01 4216 - Definitions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

DRAFT AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

« »
« »
« »
« »

and the Contractor:
(Name, legal status, address and other information)

« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

« »
« »
« »

The Architect:
(Name, legal status, address and other information)

« »
« »
« »
« »

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.

The parties should complete A101®-2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®-2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

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 a Modification, 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 SUBSTANTIAL COMPLETION

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

(Check one of the following boxes.)

☐ The date of this Agreement.

☐ A date set forth in a notice to proceed issued by the Owner.

☐ Established as follows:

(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

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

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

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

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

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

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » (\$ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

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

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement. (Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum: (Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any: (Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)

§ 4.5 Liquidated damages, if any: (Insert terms and conditions for liquidated damages, if any.)

« »

§ 4.6 Other: (Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.

(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

<< >>

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

<< >>

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

<< >>

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

<< >>

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

<< >> % << >>

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

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§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☐ Litigation in a court of competent jurisdiction

☐ Other (Specify)

<< >>

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

<< >>

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 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:

(Name, address, email address, and other information)

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§ 8.3 The Contractor's representative:

(Name, address, email address, and other information)

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§ 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 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, 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:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

<< >>

§ 8.7 Other provisions:

<< >>

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013 incorporated into this Agreement.)

<< >>

- .5 Drawings

Number	Title	Date

- .6 Specifications

Section	Title	Date	Pages

- .7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

- .8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™-2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

- .9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™-2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

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

OWNER (Signature)

« »« »

(Printed name and title)

CONTRACTOR (Signature)

« »« »

(Printed name and title)

SECTION 00 6000
PROJECT FORMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 BID BOND:

- A. A Bid Bond will be required for this project. The American Institute of Architects Document A310, February 2010 edition entitled "Bid Bond" shall be the contract bond form 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 FIVE (5%) percent of the total amount of the bid including alternates, or a Bid Bond in the amount of FIVE (5%) of the bid, including alternates, payable to the Owner, 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. 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 be retained by the Owner shall be 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.
 - 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 Best "Secured" rated or better.
- B. 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.

1.03 PERFORMANCE AND PAYMENT BOND:

- A. A Performance and Labor and Material Payment Bond will be required for this project. The bond premiums will be paid for by the Contractor.
- 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.
- 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 attorneys 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. All Surety Companies shall be permitted to do business in the State of New York and be A.M. Best Rating of "A" or better as to Policy Holder Ratings and "VII" or better as to Financial Size Category.
- H. 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 other means recognized by the court of jurisdiction to Owner.
3. Surety agrees that it is obligated under the bonds to any successor, grantee or assignee of the Owner.

END OF SECTION

SECTION 00 7200
GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.01 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.

1.01 FORM OF GENERAL CONDITIONS

- A. The general conditions applicable to this contract are attached following this page.

1.03 RELATED REQUIREMENTS

- A. Section 00 5200 - Agreement Form
- B. Section 00 7300 - Supplementary Conditions.
- C. Section 01 4216 - Definitions.

END OF SECTION

DRAFT AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

<< >>
<< >>

THE OWNER:

(Name, legal status and address)

<< >>< >>
<< >>

THE ARCHITECT:

(Name, legal status and address)

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<< >>

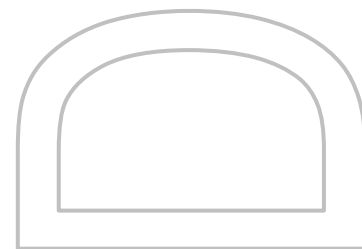
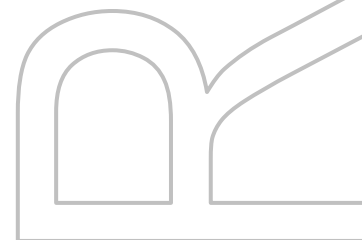
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This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.



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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, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 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 a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 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 the Owner and by Separate Contractors.

§ 1.1.5 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.

§ 1.1.6 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.

§ 1.1.7 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.

§ 1.1.8 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.

§ 1.3 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 use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk

and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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 Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 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 necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 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.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 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.

§ 2.3.6 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.

§ 2.4 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.

§ 2.5 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 prior approval of the Architect and the 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 Architect's 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 or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

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.

§ 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 Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 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 2.3.4, 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 Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the 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 Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the 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, 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.

§ 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 and 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. Unless the Architect 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.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work 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.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 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.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner 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 Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 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.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work 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.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for 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.

§ 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.

§ 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 and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect 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 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 and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that 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 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 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 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.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect 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 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

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information 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.

§ 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 Architect's approval. The Architect'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 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.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 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 Architect and Owner, and delivered to the Architect 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.

§ 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 is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is 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 Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner 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 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 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 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 and the Architect 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.

§ 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 Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

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.

§ 3.14 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.

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

§ 3.16 Access to Work

The Contractor shall provide the Owner 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 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 or Architect. 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.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, 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 this Section 3.18.

§ 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

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The 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. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of 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 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 (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor 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 Contractor 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 Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise

such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 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. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The 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 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.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 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 Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

§ 4.2.12 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 rendered in good faith.

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

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests 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 a Separate Contractor or the subcontractors of a Separate Contractor.

§ 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, as soon as practicable after award of the Contract, shall notify the Owner 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 Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

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

§ 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 and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner 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.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. 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.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 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 and Separate 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 or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify 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 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 Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor 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 a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 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 or Separate Contractor as provided in Section 10.2.5.

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

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate 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 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.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner 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 Architect and signed by the Owner, Contractor, and Architect 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.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner 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.

§ 7.3.2 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; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 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.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect 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.

§ 7.3.7 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.

§ 7.3.8 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 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.

§ 7.3.9 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 Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's 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.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the 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 Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

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. 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 Architect 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 Architect 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.

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.

§ 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.

§ 8.2 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 or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) 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; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

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

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

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 If unit 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.

§ 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 Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by 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 Architect 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 or Architect require, such as copies of requisitions, and releases and waivers of liens 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, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 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, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner 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.

§ 9.3.3 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.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor 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 Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, 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 entitled to payment in the amount certified. The foregoing representations 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 Architect. However, the issuance of a Certificate for Payment will not be a representation that the 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 Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The 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 previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from 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;
- .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.

§ 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 withholds certification for payment under Section 9.5.1.3, 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 Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a 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 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 Architect 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 Architect and Owner 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 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 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 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.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 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 that the Owner can occupy or utilize the Work for its intended use.

§ 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 prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. 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 Contractor's list, the Architect 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 Contractor's 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 to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare 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 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 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.

§ 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 shall 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.

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

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's 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 Architect's final 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.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (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) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) 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.

§ 9.10.3 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 Architect so confirms, the Owner shall, upon application by the Contractor and certification by the 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 prior to certification of such payment. Such payment shall 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.

§ 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.

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.

§ 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; and
- .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.

§ 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.

§ 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.

§ 10.2.4 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.

§ 10.2.5 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 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. 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 or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. 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. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner 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 and Substances

§ 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 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 in writing to the Contractor and Architect the names and qualifications of persons or entities who are 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 Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. 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 Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, 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 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), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 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.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 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.

§ 11.1.3 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.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) 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 notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner 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 purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to

provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 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 Architect and Architect's consultants; and (3) 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 Architect, Architect's consultants, 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 and Architect 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 Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the 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 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 Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's 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 Architect has not specifically requested to examine prior to its being covered, the 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 and Contract Time as may be appropriate. 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 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 Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year 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. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-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 one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 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 or Separate 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

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 effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 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 and Remedies

§ 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.

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

§ 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 Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the 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 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 Architect of when and where tests and inspections are to be made so that the 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 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 Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the 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 bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

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 Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, 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, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner 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.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper 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 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 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, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven 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; and
- .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.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the 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 be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 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.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 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; and
- .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.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

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.

§ 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, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 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 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 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.

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.

§ 15.2 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 Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. 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 an initial 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 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 but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 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.

§ 15.2.8 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.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SECTION 00 7300
SUPPLEMENTARY CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. These Supplementary Conditions amend and supplement the General Conditions defined in Document 00 7200 - General Conditions and 00 7300A Supplementary Conditions and other provisions of the Contract Documents as indicated below. Provisions that are not so amended or supplemented remain in full force and effect.
- B. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SUPPLEMENTARY GENERAL CONDITIONS TO AIA DOCUMENT A201-2017
GENERAL CONDITIONS FOR THE CONTRACT OF CONSTRUCTION,
DATED XXXXXX, 2022 BY AND BETWEEN
("OWNER")
AND
("CONTRACTOR")**

GENERAL CONDITIONS

The General Conditions of the Contract for Construction, AIA Document A201-2017, Articles 1 through 15 inclusive, 2 pages, is hereby designated as one of the Contract Documents, and shall govern the Work under this Contract.

SUPPLEMENTARY GENERAL CONDITIONS

The Supplementary General Conditions set forth herein are likewise designated one of the Contract Documents, and amend and supplement, and in some cases, void portions of the General Conditions (AIA A201-2017) as set forth below and except as hereby amended and supplemented (or voided) the AIA General Conditions shall remain in full force and effect. The article numbers set forth in the Supplementary General Conditions correspond to (or are in addition to) the article numbers set forth in the AIA General Conditions (AIA Document A201-2017).

ARTICLE 1 - GENERAL PROVISIONS

1. Article 1, Subparagraph 1.1.2: In paragraph 1.1.2 in the first line, before the word "represents" add the following: "(or the "Agreement"); and in the seventh line, after the word "Architect", add "as a representative of the Owner,".
2. Article 1, Subparagraph 1.2.1: Delete the second sentence of subparagraph 1.2.1 beginning "The Contract Documents are complementary..." in its entirety from this Agreement. Add the following new subparagraph 1.2.1.2 at the end of subparagraph 1.2.1.1:

1.2.1.2 In the event of conflicts or discrepancies amongst the Contract Documents, interpretations will be based on the following priorities:

- .1 the Agreement.
- .2 Addenda, with those of later date having precedence over those of an earlier date.
- .3 the Supplementary Conditions.
- .4 the General Conditions of the Contract for Construction.
- .5 Drawings and Specifications.

In the case of an inconsistency between or among the Contract Documents, the more specific provision will take precedence over the less specific; the more stringent will take precedence over the less stringent; the more expensive item will take precedence over the less expensive, in accordance with the Architect's interpretation. Scaling Drawings for dimensions, if done, is done at the Contractor's own risk.

3. Article 1, add subparagraph 1.6.3:

1.6.3 "ALL NOTICE REQUIREMENTS WILL BE STRICTLY CONSTRUED."

ARTICLE 2 - OWNER

4. Article 2, Subparagraph 2.1.1.1: Add the following new subparagraph 2.1.1.1 immediately after subparagraph 2.1.1 of this Agreement:

2.1.1.1 Wherever the word "Owner" or a pronoun in place of it occurs in the Contract Documents it refers to the:

Board of Education
Warwick Valley Central School District
225 West Street Ext
Warwick, New York 10990

5. Article 2, Subparagraph 2.2.1: Delete this Subparagraph 2.2.1 in its entirety from this Agreement.
6. Article 2, Subparagraph 2.2.4: In the third line of this Subparagraph 2.2.4, add the word "reasonable", before the word "accuracy."
7. Article 2, Subparagraph 2.2.4: In line two of this Subparagraph 2.2.4, delete the word "shall" and replace it with the word "may."
8. Article 2, Subparagraph 2.3.65: Delete subparagraph 2.3.6 in its entirety from this Agreement and use the following new subparagraph 2.3.6 in lieu thereof:

2.3.6 The Contractor will be furnished, free of charge, 10 copies of Drawings and Project Manuals. Owner shall furnish additional sets upon Contractor's written request at the cost of reproduction, postage and handling. Subcontractors and other entities desiring copies of Drawings and Project Manuals shall obtain them from the Contractor.

9. Article 2, Subparagraphs 2.3.2.1 and 2.3.2.2: Add the following new subparagraphs 2.3.2.1 and 2.3.2.2 immediately after subparagraph 4.1.1 of this Agreement:

2.3.2.1 Wherever the word Architect or Architects or a pronoun in place of either occurs in the Contract Documents it refers to:

Eisenbach and Ruhnke Engineering, P.C.
291 Genesee Street
Utica, NY 13501

2.3.2.2 The firms listed on the title sheet of the Project Manual are Consultants employed by the Architect, and are agents of the Architect and will make observation of their respective branches of the Project. All changes in the Work must be processed through the Architect.

ARTICLE 3 - CONTRACTOR

10. Article 1, Subparagraph 3.2.1: Delete subparagraph 3.2.1 in its entirety from this Agreement and use the following new subparagraph in lieu thereof:

3.2.1 By executing the Contract, Contractor represents and warrants to the Owner that:

.1 Contractor is and will be financially responsible and has and will have sufficient liquidity to meet its financial responsibilities under the Contract and for all other Projects in which Contractor is or may become involved;

- .2 Contractor has carefully examined the Contract Documents and has visited and examined the site;
- .3 from Contractor's investigation, Contractor has satisfied itself as to the nature and location of the proposed Work, general and local conditions, and all matters which may in any way affect the Work or its performance; and
- .4 Contractor fully understands the intent and purpose of the Contract Documents.
- .5 The Contractor acknowledges that the Owner is a school district which is subject to various laws and regulations of the State of New York. The Contractor will, in each phase of the Contract, in accordance with applicable standards, comply with applicable laws and regulations as they pertain to the bidding and construction of the Project, including, without limitation, the requirements of Article 5-A of the General Municipal Law; Article 9 of the Education Law; and Sub-Chapter J, Part 155 of Title 8, Chapter II of the Codes, Rules and Regulations of the State of New York.

Claims for additional compensation and/or extension of time relating to Contractor's non-compliance with its representations and warranties in the preceding sentence will not be allowed.

11. Article 3, Subparagraph 3.2.3: Add the following sentence at the end of this Subparagraph 3.2.3:

The Contractor shall be liable to the Owner for any damage resulting from any such errors, inconsistencies or omissions in the Contract Documents not reported to the Architect.

12. Article 3, Subparagraph 3.4.2: Add the following language at the end of this Subparagraph 3.4.2:

", assessing the Architect's charges for evaluation against the Contractor."

13. Article 3, Subparagraphs 3.4.4 and 3.4.5: Add the following new subparagraphs 3.4.4 and 3.4.5 immediately after subparagraph 3.4.3 of this Agreement:

3.4.4 After the Contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications) and as set forth below.

3.4.4.1 The Architect will be allowed a reasonable time within which to evaluate each proposed substitution. The Architect will be the sole judge of equivalence, and no substitution shall be ordered, installed or utilized without the Architect's prior written acceptance. Owner may require Contractor to furnish at the Contractor's expense a special performance guarantee or other surety with respect to any substitution. The Architect will record time required by the Architect and the Architect's Consultants in evaluating substitutions proposed by Contractor and in making changes in the Contract Documents occasioned thereby. Whether or not the Architect accepts a proposed substitution, Contractor shall reimburse Owner for the charges of the Architect and the Architect's Consultants for evaluating each proposed substitution.

3.4.5 By making requests for substitutions based on subparagraph 3.4.4 above, the Contractor:

- .1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
- .2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
- .3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and
- .4 will coordinate the installation of the accepted substitution making such changes as may be required for the Work to be complete in all respects.

14. Article 3, Subparagraph 3.5: Add the following language at the end of paragraph 3.5 of this Agreement:

Neither final payment, nor provision in Contract Documents, nor partial or entire occupancy of premises by Owner shall constitute an acceptance of Work not done in accordance with Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

15. Article 3.6 Taxes : Substitute the following provisions in lieu of Article 3.6:

3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work 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 The Owner represents that it is an organization operated for purposes which makes it exempt from New York Sales and Compensating Use Tax pursuant to Section 1115(a)(15) of the Tax Law, as amended by laws of New York 1974, Ch. 513 and 514. The Contractor is advised that the Owner is exempt from payment of all State and Local sales and compensating use taxes of the State of New York and cities and counties on the purchase of all materials and supplies incorporated in and becoming an integral component part of the structures, buildings or real property, pursuant to the provisions of this Contract. Such taxes are not to be included in the Contract Sum, Bid or costs to be reimbursed, as the case may be. This exemption does not, however, apply to tools, machinery, equipment or other property leased by or to the Contractor or a Subcontractor or to supplies and materials which, even though they are consumed in the performance of the Contract, are not incorporated into the completed permanent work, and the Contractor and its Subcontractors shall be responsible for and pay all applicable taxes, including sales and compensating use taxes, on such leased tools, machinery, equipment or other property and upon all such unincorporated supplies and materials. Owner shall deliver to Contractor the appropriate exemption certificate required to be supplied by the Owner, and Contractor and its Subcontractors and material suppliers shall be solely responsible for obtaining or delivering any and all exemption or other certificates and for furnishing a Contractor Exempt Purchase Certificate or other appropriate certificates to all persons, firms or corporations from whom they purchase supplies, materials and equipment for the performance of the work covered by this Contract.

3.6.3 Except as otherwise specified, all Federal, State and Local taxes are included in the Contract Sum.

3.6.4 Contractor shall pay all costs and liabilities for the amounts assessed, or which may be assessed by the Federal, State and local governments under any and all Acts or Laws upon the wages and salaries paid or to be paid all employees of the Contractor and its Subcontractors under this Contract.

16. Article 3, Subparagraph 3.7.1: Delete subparagraph 3.7.1 in its entirety from this Agreement and use the following new subparagraph 3.7.1 in lieu thereof:
- 3.7.1 The Owner shall provide the building permit. The Contractor shall secure and pay for all required permits, governmental fees, licenses, certificates of inspection, of occupancy, of Underwriters, and all other required certificates for the Work, necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when bids are received. The Contractor shall promptly deliver copies of such documents to the Owner.
17. Article 3, Subparagraph 3.7.3: In the first line of subparagraph 3.7.3, replace the word "knowing" with the following language: "and knows or should know...". In the last line after the word "correction", add the following language: " , including applicable fines, or penalties".
18. Article 3, Subparagraph 3.7.6: Add the following new subparagraph 3.7.6 immediately after subparagraph 3.7.5 of this Agreement:
- 3.7.6 The Contractor shall be responsible for securing and paying for permits for itself and its employees, as required by applicable law. Contractor represents that all such required licenses, fees or permits are or will be secured by the date of execution of the Contract, where possible, and in no case later than commencement of the Work. Failure to possess any such license constitutes a material breach of this Contract.
19. Article 3, Subparagraph 3.8.2.2: Add the following language at the end of subparagraph 3.8.2.2 of this Agreement: "except when installation is specified as part of the allowance in the General Requirements (Division 1 of the Specifications)".
20. Article 3, Subparagraph 3.10.3: In the second line after the word "Architect", insert the following language: "and approved by the Owner".
21. Article 3, Subparagraph 3.10.4 and 3.10.5: Add the following new subparagraphs 3.10.4 and 3.10.5 immediately after subparagraph 3.10.3 of this Agreement:

3.10.4 PROJECT SCHEDULING

- .1 After the Contractor has received from the Owner a notice to proceed or a letter of intent, a preconstruction conference will be held. The procedures and scheduling of the Work will be discussed.
- .2 At the preconstruction conference, the General Contractor shall submit an estimated preliminary (bar chart or critical path method) progress schedule of its own Work indicating starting dates and estimated completion dates of each of the items of Work or material to be installed, and completion date(s) of its Work, using the time of completion set forth in the Contract Documents. Fifteen copies of this preliminary schedule shall be submitted.
- .3 Within 14 days of receipt of this preliminary schedule and using this preliminary schedule prepared by the General Contractor as a guide, each other Prime Contractor shall prepare a preliminary progress schedule of its own Work indicating the starting dates and time of completion of each of the items of Work or material to be installed, and completion date(s) of its Work, dovetailing such dates with the indicated dates in the General Contractor's preliminary schedule and send 15 copies to the Architect.
- .4 When the schedules from each Contractor have been received by the Architect, the Architect will call a meeting of all Contractors. The schedule

shall be discussed by all Contractors and adjusted by them as may be deemed necessary to perform the Work of the Project. Based on these discussions, each Contractor shall submit 5 copies of its revised progress schedule to the Architect. After review and acceptance of the progress schedules by the Architect and Owner, the General Contractor shall perform the ministerial task of preparing a composite progress schedule. Fifteen copies of the composite progress schedule shall be provided to the Architect for distribution.

- .5 Once the composite progress schedule has been agreed upon by all of the Contractors, the Architect and the Owner, it shall be signed by all Contractors and shall be strictly enforced until the Project is completed, unless it becomes necessary to revise it by an appropriate modification.
- .6 No payments will be made on any of the Contracts until the scheduling procedures in this subparagraph 3.10.4 have been completed.

3.10.5 PROCEDURES AND SCHEDULE OF WORK

- .1 Unless otherwise stated, the Work shall be progressed continuously, without interruption, so that all Work can be completed in the time set forth in the Contract Documents.
- .2 The Contractor shall cooperate with the Owner so as to interfere as little as possible with the operations of the Owner. The Owner's approval shall be obtained prior to the starting of operations which may interfere with the operations of the Owner.

22. Article 3, Subparagraph 3.12.10: Delete this Subparagraph 3.12.10 in its entirety.

23. Article 3, Subparagraph 3.15.1: In the first line after the word "Contractor", insert the following language: ", at all times,"; and in the second line after the word "remove", insert the word "all".

24. Article 3, Subparagraph 3.18.1: Delete subparagraph 3.18.1 in its entirety from this Agreement and use the following new subparagraphs 3.18.1.1 and 3.18.1.2 in lieu thereof:

3.18.1.1 To the maximum extent permitted by law, the Contractor hereby assumes the entire responsibility and liability for any and all damage (direct or consequential) and injury (including death), disease or sickness of any kind or nature whatsoever, to all persons, whether or not employees of the Contractor, and to all property and business or businesses, caused by, resulting from, arising out of, or occurring in connection with:

- .1 the Work;
- .2 the performance or intended performance of the Work;
- .3 the performance or failure to perform the Contract; or
- .4 any occurrence which happens in or about the area where the Work is being performed by the Contractor, either directly or through a Subcontractor, or while any of Contractor's property, equipment or personnel is in or about such area.

3.18.1.2 Except to the extent, if any, expressly prohibited by law, should any such damage or injury referred to in subparagraph 3.18.1.1 be sustained, suffered, or incurred by Owner or Architect, or should any claim for such damage or injury be made or asserted against any of them, whether or not such claim is based upon Owner's or Architect's

alleged active or passive negligence or participation in the wrong or upon any alleged breach of any statutory duty or obligation on the part of the Owner or Architect, Contractor shall indemnify and hold harmless Owner and Architect, their Board of Education, Administration officers, agents, partners, and employees (hereinafter collectively referred to as "Indemnitees"), of, from and against any and all other loss, cost, expense, and liability, including without limitation, legal fees and disbursements, that Indemnitees may directly or indirectly sustain, suffer or incur as a result of such damages, injuries and claims; and Contractor agrees to assume, on behalf of any and all Indemnitees the defense (with counsel satisfactory to the party indemnified) of any action at law or in equity, or other legal proceeding, which may be brought against any Indemnitee upon or by reason of such damage, injury or claim and to pay on behalf of every Indemnitee, the amount of any judgment, decree, award, or order that may be entered against each said Indemnitee in any such action or proceeding. In the event that any such claim, loss, cost, expense, liability, damage or injury is sustained, suffered, or incurred by, or is made, asserted or threatened against any Indemnitee, Owner shall, in addition to all other rights and remedies, have the right to withhold from any payments due and to become due to Contractor an amount sufficient in Owner's judgment to protect and indemnify the Indemnitee(s) from and against any and all such claim, loss, cost, expense, liability, damage or injury, including legal fees and disbursements; or Owner, in its discretion, may require Contractor to furnish a surety bond satisfactory to Owner guaranteeing such protection which bond shall be furnished by Contractor within 5 days after written demand has been made therefore. In the event more than one Contractor is connected with an event or occurrence (or series of events or occurrences) covered by this indemnification, then all such Contractors shall be jointly and severally responsible to the Indemnitee, and the ultimate responsibility among such indemnifying Contractors shall be settled or otherwise determined by separate proceedings and without loss, expense or damage to any Indemnitee.

25. Article 3, Subparagraphs 3.18.3, 3.18.4, 3.18.5 and 3.18.6: Add the following new subparagraphs 3.18.3, 3.18.4, 3.18.5 and 3.18.6 immediately after subparagraph 3.18.2 of this Agreement:

3.18.3 In any and all claims against the Owner or the Architect or their agents or employees by third parties, the indemnification obligation under this paragraph 3.18 shall apply and shall not be limited by limitation or amount of or type of damages, compensation, or benefits payable by or for the Contractor or Subcontractors.

3.18.4 Contractor shall comply with, and cooperate with, Architect and Owner in complying with legal requirements. Among other things, Contractor shall be responsible for performing corrective work within abatement periods, appealing from decisions or orders, requesting extensions on abatement periods, and furnishing such information or evidentiary material as may be necessary or as may be requested by Architect or Owner to fully protect the rights and interests of Owner and Architect with respect to possible, threatened or pending proceedings or orders.

3.18.5 Without limitation, Contractor shall indemnify Owner and/or Architect pursuant to paragraph 3.18 hereof in respect of subparagraph 3.18.4 and the responsibilities of Contractor specified in Article 13 and subparagraphs 3.6.2, 3.19.3, 3.19.5 and 3.19.10 and elsewhere in the Contract Documents pertaining to legal requirements.

3.18.6 Natale Patent Rights. For any Contractor performing asbestos abatement as part of its Scope of Work:

- .1 Contractor shall hold a valid current license to perform work using the negative pressure system covered by the Natale Patent or provide an Indemnity Agreement as follows:
- .2 Indemnity Agreement: Contractor and Contractor's surety agree to protect, indemnify and hold harmless the Owner and the Architect, and the Board

of Education, Administration directors, officers, agents, employees, and assigns of the Architect from any and all claims, judgments, liabilities, expenses, attorney fees, court costs, or losses of any nature, resulting from claims of patent right infringement including but not limited to U.S. Patent Number 4,604,111, commonly known as the Natale Patent, arising out of the performance of Work on the Project.

- (a) The provisions of this Indemnity Agreement shall protect the Indemnitees against all claims arising out of the subject matter or performance of this Contract and Contract Documents, including, without limitation, allegations or findings that the Indemnities, or any of them, were guilty of negligence in the issuance of such Contract.
- (b) The provisions of this Indemnity Agreement shall be in addition to and shall in no way delete any provisions, including warranty and indemnity provisions of the Agreement.

26. Article 3, Paragraph 3.19: Add the following new paragraph 3.19 immediately after paragraph 3.18 of this Agreement:

3.19 CONTRACTOR'S RESPONSIBILITIES

Contractor agrees, in addition to all other responsibilities and duties under the Contract:

3.19.1 To use all necessary means to discover and to notify Architect in writing of any defect in other Work upon which the satisfactory performance of the Work may depend, and to allow a reasonable amount of time for remedying such defects. If Contractor should proceed with the Work, Contractor shall be considered to have accepted and be responsible for such other Work unless over Contractor's written objection, Contractor shall have proceeded pursuant to written instructions from Architect.

3.19.2 To submit to Owner and Architect promptly upon request, information with respect to the names, responsibilities and titles of the principal members of Contractor's staff.

3.19.3 To take all steps necessary to avoid labor disputes; and to be responsible for any delays and damages to Owner caused by such disputes.

3.19.4 To pay for costs of repair to other Work attributable, in whole or in part, to the fault or negligence of Contractor and Owner's charges for removal of rubbish attributed by Owner or Architect to Contractor, and any cleanup related to Contractor or the Work.

3.19.5 To comply with all legal requirements; to appear at hearings, proceedings or in court in respect of such compliance or in respect of violations or claimed violations of legal requirements; to pay any fines or penalties imposed for said violations; and to pay all legal fees, fines and penalties incurred by or imposed upon Owner relating to Contractor's compliance, violations or claimed violations. Without limiting the foregoing, Contractor shall appear at hearings, proceedings and/or in court and consent to its substitution as a party defendant in respect of all summonses and claimed violations arising out of or relating to the Work.

3.19.6 Not to display on or about the Project site any sign, trademark or other advertisement, without written consent of the Owner.

3.19.7 That before any subcontractor or supplier is employed by Contractor, the name of such Subcontractor or supplier shall be submitted in writing to the Owner through the Architect, and no Subcontractor or supplier shall be employed unless acceptable to the

Owner. Each Subcontractor and supplier shall be bound by all Contract Documents to the same extent and with the same effect as if the Subcontractor or supplier were the Contractor. Contractor shall cause Subcontractors and suppliers to comply with all the Contract Documents. Contractor shall be responsible for all the acts, work, material and equipment of its Subcontractors and supplier and all persons either directly or indirectly employed by any of them.

3.19.8 That in the event of any dispute as to whether any item or portion of the Project is within the scope of the Work to be performed by Contractor or any dispute as to whether Contractor is entitled to an extra payment, Contractor shall continue to proceed diligently with the performance of the Work, the Contract, and the disputed Work. The resolution, by agreement or otherwise, of the disputed Work, shall be made between Contractor and Owner with reasonable promptness. In no event shall delay in such resolution excuse prompt performance by Contractor of the Work, the Contract and the disputed Work.

3.19.9 To:

- .1 furnish a competent and adequate staff and use its best skill and attention for the proper administration, coordination, supervision and superintendence of the Work;
- .2 organize the procurement of all materials and equipment so that they will be available at the time needed for the Work;
- .3 keep an adequate force of skilled workers on the job to complete the Work in strict accordance with all requirements of the Contract Documents;
- .4 maintain throughout the duration of the Work a competent superintendent and any necessary assistants, all of whom shall be acceptable to Owner and shall not be changed without the consent of the Owner;
- .5 enforce discipline and order among Contractor's employees and not to employ at the Project any unfit person or anyone not skilled in the task assigned; and
- .6 provide supervision by experts in all aspects of the application of the materials, equipment or system being fabricated and installed.

3.19.10 That if any Work is performed which is contrary to legal requirements, to promptly make all changes as required and take all other corrective action to comply therewith and pay all costs arising therefrom.

3.19.11 That any review or consideration by Owner or Architect of any method of construction, invention, appliance, process, article, device or material of any kind shall be for its general adequacy for the Work and shall not be an approval for the use thereof by Contractor in violation of any patent or other rights of any third person. Owner and Architect shall in no event be deemed to have reviewed or to have been required to review or consider the means and methods of construction, all of which are chosen exclusively by the Contractor.

3.19.12 That if any provision of the Contract Documents conflicts with any agreement among members of trade associations, or with a union or labor council which regulates the work to be performed by a particular trade, to reconcile such conflict without delay or damage to Owner. In the event the progress of the Work is delayed by such conflict, Architect may require that other material or equipment of equal or better kind and quality be provided at no additional cost to Owner. This right of substitution shall not limit other rights which Owner may have concerning such delay.

3.19.13 In accordance with the Health Law and the Education Law, the Contractor, including any of its employees, subcontractors, suppliers or materialmen or other representatives, shall not use tobacco in any form on school property during the course of the Work. Contractors failing to abide by this requirement shall be prohibited from working at the site and shall be responsible for any consequent delays or added costs to the Owner as a result of such noncompliance.

3.19.14 The Contractor shall provide reasonable and visible identification for each employee, subcontractor, or other person at the Project site, and shall, upon request of the Owner, make available a list of names of those employees, subcontractors or others working under the direction of the Contractor at the Project site. Any such identification shall be reasonably visible to the Architect and to school personnel at all times to allow the Owner to maintain the safety and security of school buildings, school property and persons at the Project site. Contractors failing to abide by this requirement shall be prohibited from working at the site and shall be responsible for any consequent delays or added costs to the Owner as a result of such noncompliance.

27. Article 3, Subparagraph 3.19.15: Add the following new subparagraph 3.19.15 immediately after subparagraph 3.19.14 of this Agreement:

3.19.15.1 Initial Dispute Resolution. If a dispute arises out of or related to this Agreement or its breach, the parties shall endeavor to settle the dispute first through direct discussions. If the dispute cannot be settled through direct discussions, the parties shall endeavor to settle the dispute by mediation under the Construction Industry Mediation Rules of the American Arbitration Association or other dispute resolution service acceptable to the parties. The location of the mediation shall be the location of the Project. Once a party files a request for mediation with the other party and with the American Arbitration Association or other service, the parties agree to conclude such mediation within thirty (30) days of filing of the request. Costs shall be borne equally by the parties. Agreements between Owner and Contractor and Owner shall include this dispute resolution clause and each party to such agreement shall have the same duties under those separate agreements which the Owner and Architect have under this Agreement and shall be available for multiparty mediation pursuant to this paragraph.

3.19.15.2 Work Continuance and Payment. Unless otherwise agreed in writing, the Owner and Contractor shall continue to perform under this Agreement during any non-judicial dispute resolution proceedings. If the Contractor continues to perform, the Owner shall continue to make payments in accordance with this Agreement.

ARTICLE 4 - ADMINISTRATION OF THE CONTRACT

28. Article 4, Subparagraph 4.1.2: In the second line, following Owner, delete the word ", Contractor"

Article 4, Subparagraph 4.1.2: In the first line, after the word "Architect" delete "as set forth in the Contract Documents"

29. Article 4, Subparagraph 4.2.2: Add the following language at the end of this Subparagraph 4.2.2:

On the basis of onsite observations and otherwise, the Architect shall keep the Owner informed of the progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

30. Article 4, Subparagraph 4.2.2.1: Add the following new subparagraph 4.2.2.1 immediately after subparagraph 4.2.2 of this Agreement:

4.2.2.1 The Architect will promptly report to the Owner any defects or deficiencies of the Work of the Contract which he may observe.

31. Article 4, Subparagraph 4.2.5: After the word "Architect's" in the first line, add the words "observations and".
32. Article 4, Subparagraph 4.2.6: In line one, following the word "authority", add the words "and responsibility".
33. Article 4, Subparagraph 4.2.7: In the third line of subparagraph 4.2.7, delete the phrase "information given and" in its entirety from this Agreement.
34. Article 4, Subparagraph 4.2.11: In the first line of subparagraph 4.2.11, delete the words "interpret and decide matters" and replace them with the words "provide recommendations".
35. Article 4, Subparagraph 4.2.12: In the third line of this subparagraph 4.2.12, delete the word "decisions"
36. Article 4, Subparagraph 4.2.12.1: Add the following new subparagraph 4.2.12.1 immediately after subparagraph 4.2.12 of this Agreement:

4.1.12.1 If Work is described or indicated in a manner which makes it impossible to carry out the requirements of the Contract Documents, or should discrepancies appear among the Contract Documents, the Contractor shall request interpretation before proceeding with the Work. If Contractor fails to make such a request, no excuse will be entertained for failure to carry out the Work of the Contract Documents. Should a conflict occur in or between Contract Documents, the Contractor is deemed to have estimated on the more expensive way of doing the Work.

37. Article 4, Paragraph 4.3: Add the following new paragraph 4.3 to Article 4 of this Agreement:

4.3 OWNER'S SITE REPRESENTATIVE

4.3.1 The Owner may engage an Owner's Site Representative. The duties, responsibilities and limitations of the Owner's Site Representative shall be as follows:

4.3.2 Unless otherwise provided, the Owner's Site Representative shall:

- .1 Observe the progress and quality of the Work as is reasonably necessary at that stage of construction to determine in general that it is proceeding in accordance with the Contract Documents and notify the Architect immediately if, in the Owner's Site Representative's opinion, Work does not conform to the Contract Documents or requires special inspection or testing.
- .2 Monitor the construction schedule and report to the Owner and Architect conditions which may cause delay in completion.
- .3 Review Contract Documents with the Contractor's superintendent and obtain necessary interpretations from the Architect.
- .4 Consider the Contractor's suggestions and recommendations, evaluate them and submit recommendations to the Architect for decision.
- .5 Attend preconstruction and progress meetings.
- .6 Observe tests required by the Contract Documents and report to Architect. Verify testing invoices to be paid by the Owner, if any.

- .7 Maintain records at the site in an orderly manner. Include correspondence, Contract Documents, Change Orders, Construction Change Directives, Architect's Supplemental Instructions, meeting and field reports, Shop Drawings, Product Data, Samples, detail drawings, color schedules, Applications for Payment, and names, addresses and telephone numbers of Contractors, Subcontractors and principal material suppliers.
- .8 Keep a log recording the Owner's Site Representative's time and activities relating to the Project, weather conditions, nature and location of the Work being performed, verbal instructions and interpretations given to the Contractor, substantial deliveries of materials, number of workers on site by Contract and specific observations. Record any occurrence or Work that might result in a claim for a change in Contract Sum or Contract Time. Maintain a list of visitors, their titles, and the time and purpose of their visit.
- .9 Notify the Architect if any portion of the Work requiring Shop Drawings, Product Data or Samples is commenced before such submittals have been processed by the Architect. Maintain custody of Samples.
- .10 Observe the Contractor's Record Drawings at intervals appropriate to the stage of construction and notify the Architect of any apparent failure of the Contractor to maintain current records.
- .11 Review Applications for Payment submitted by the Contractor, initial and return them to the Contractor with findings for disposition. In any instance when a recommendation for substantially less than full payment requested is made, also notify the Owner of such recommendation.
- .12 Review, and if acceptable, sign Contractor's daily records of time spent and materials utilized associated with "time and materials" Change Orders and Construction Change Directives.
- .13 Review the list of items to be completed or corrected which is submitted by the Contractor with a request for issuance of a Certificate of Substantial Completion. Inspect the Work and if the list is accurate, forward it to the Architect for disposition; if not, so advise the Architect and return the list to the Contractor for correction.
- .14 Order the Contractor to stop the Work or any portion thereof under the conditions of paragraph 2.3.

4.3.3 Unless otherwise provided, the Owner's Site Representative shall not:

- .1 Authorize deviations from the Contract Documents.
- .2 Accept substitute materials or equipment.
- .3 Assume any of the responsibilities of the Contractor's Superintendent or of Subcontractors.
- .4 Communicate with Subcontractors.
- .5 Advise on, or issue directions concerning, aspects of construction means, methods, techniques, sequences or procedures, or safety precautions and programs in connection with the Work.

ARTICLE 5 - SUBCONTRACTORS

38. Article 5, Subparagraph 5.1.1: In the second line, delete the phrase "at the site" in its entirety from this Agreement.
39. Article 5, Subparagraph 5.1.2: In the second line, delete the phrase "at the site" in its entirety from this Agreement.
40. Article 5, Subparagraph 5.2.1.1: Add the following new subparagraph 5.2.1.1 immediately after subparagraph 5.2.1 of this Agreement:

5.2.1.1 Not later than 72 hours after the Contractor's receipt of Contract award notification, the Contractor shall furnish in writing to the Owner through the Architect the names of persons or entities proposed as manufacturers and proprietary product names.

41. Article 5, Subparagraph 5.2.3: Commencing in the third line, delete the second and third sentences of subparagraph 5.2.3 in their entirety from this Agreement.
42. Article 5, Subparagraph 5.2.5: Add the following new subparagraph 5.2.5 immediately after subparagraph 5.2.4 of this Agreement:

5.2.5 The Contractor shall not award work to any one Subcontractor in excess of fifty percent (50%) of the Contract Sum, without prior written approval of the Owner.

ARTICLE 7 - CHANGES IN THE WORK

43. Article 7, Subparagraph 7.1.2: Add the following new subparagraph 7.2.2 immediately after subparagraph 7.2.1 of this Agreement:

7.2.2 All Change Orders must have the approval of the Owner in writing.

44. Article 7, Article 7.3.4: Commencing in the fourth line, replace the words "an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement a reasonable amount" with the following "an allowance for overhead and profit in accordance with subparagraph 7.3.11".
45. Article 7, Article 7.3.11: Add the following new subparagraph 7.3.11 immediately after subparagraph 7.3.10 of this Agreement:

7.3.10 In subparagraph 7.3.4, the allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:

Change Order Cost (not includ- ing overhead and profit)_____	Profit and Overhead on Contractor's Own Work__	Profit and Overhead on Subcontractor's Work for this Contractor____	Profit and Overhead on Subcontractor's Own Work____
0- 5,000	18%	9%	13%
5,001- 10,000	17%	9%	12%
10,001- 30,000	16%	8%	12%
30,001- 50,000	15%	8%	11%
50,001- 100,000	14%	8%	11%
Over 100,001	13%	8%	10%

7.3.11.1 Cost to which overhead and profit is to be applied shall be determined in accordance with subparagraph 7.3.6.

7.3.11.2 To facilitate checking of quotations for extras or credits, all proposals shall be accompanied by a complete itemization of costs including labor, materials, Subcontracts, overhead and profit. Subcontracts shall also be so itemized.

ARTICLE 8 - TIME

46. Article 8, Paragraph 8.2: Delete paragraph 8.2 in its entirety from this Agreement and use the following new subparagraph 8.2 in lieu thereof:

8.2 PROGRESS AND COMPLETION.

8.2.1 TIME IS OF THE ESSENCE IN THE COMMENCEMENT, PROSECUTION AND CONSTRUCTION OF THE WORK. Contractor shall be responsible for all direct and consequential damages to Owner and Architect arising from any delay of Contractor, its Subcontractors and suppliers, in performing or completing the Work in accordance with the time requirements of paragraph 8.2. The indemnity provisions of Articles 3 and 11 are applicable to such damages and to claims arising in respect thereto.

8.2.2 Contractor shall do all things necessary to ensure the prosecution of the Work in accordance with any one or more of the following as determined by Architect, as a representative of the Owner, in its discretion:

- .1 Project schedules and revisions thereof, given from time to time by Contractor;
- .2 the time requirements for various portions of Work;
- .3 the requirements of the Project including, but not limited to, coordination requirements as may from time to time be known to Contractor;
- .4 schedules of the Work provided by Contractor to Architect upon Architect's request.

8.2.3 Should the progress of the Work and/or other Work be delayed by any fault, neglect, act or failure to act of Contractor or any of its Subcontractors or suppliers so as to cause any additional cost, expense, liability or damage to Owner or Architect or for which Owner or Architect may become liable, Contractor shall hold Owner and Architect harmless from and indemnify Owner and Architect against all such additional cost, expense liability or damage in accordance with the provisions of Article 11.

8.2.4 The Work shall be performed during designated working hours, except that in the event of emergency or when necessary to perform the Work in accordance with the requirements of paragraph 8.2, Work shall be performed at Contractor's cost and expense on other shifts, overtime, Saturdays, Sundays, Holidays and at other times, if permission to do so has been obtained in writing from Owner. Without limiting the requirements of the preceding sentence, if the progress of the Work or of the Project has been delayed by any fault, neglect, act or failure to act of Contractor or any of its Subcontractors or suppliers, Contractor shall work such overtime, at Contractor's cost and expense as aforesaid, as Architect shall deem necessary or desirable to make up for all time lost and to avoid delay in the completion of the Work and of the Project. The failure by Architect to direct Contractor to engage in such overtime shall not relieve Contractor of the consequences of its delay.

8.2.5 Unless otherwise noted, the date of commencement of the Work is the date established in a notice to proceed. The notice to proceed will be issued immediately upon return of signed documents by the Contractor and the presentation of acceptable insurance certificates. Contractor shall organize construction schedules as specified in paragraph

3.10, Contractor's Construction Schedules. The commencement date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

8.2.6 Architect may direct acceleration of the Work so that it may be performed in advance of the schedules, time requirements and Project requirements described in paragraph 8.2. If so directed, Contractor shall increase its staff and/or work overtime. Contractor will not be entitled to additional compensation for work performed outside of designated working hours, except as approved by Owner and authorized in writing by Architect. Provided that Contractor is not in default under the Contract, and Architect has issued the aforesaid authorization, there shall be added to the Contract Sum as actual out-of-pocket amount equal to:

- .1 additional wages actually paid, at rates which have been accepted by Architect;
- .2 taxes imposed by law on such additional wages;
- .3 premiums for worker's compensation and liability insurance if required to be paid on such additional wages.

Written authorization for overtime which exceeds \$500.00 for which Contractor intends to charge Owner in any one week shall be invalid unless confirmed in writing by the Owner, it being understood that Owner's Site Representative shall not have authority to authorize such overtime which exceeds \$500.00 in any one week.

8.2.7 Contractor and Contractor's surety shall be strictly accountable for completion as a condition to satisfactory contractual performance.

47. Article 8, Paragraph 8.3: Delete paragraph 8.3 in its entirety from this Agreement and use the following new paragraph 8.3 in lieu thereof:

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 If Contractor claims an increase in the Contract Sum or an extension in the completion time required by reason of a change in the Work, Contractor shall give Architect written notice within fourteen (14) days after Contractor's knowledge of the occurrence of the matter giving rise to such claim. This notice shall be given by Contractor before proceeding to execute the changed Work, except in an emergency endangering life or property in which case Contractor shall proceed in accordance with paragraph 10.3. No such claim will be valid unless notice is given as required in this paragraph. Contractor shall proceed to execute the Work, even though the increase or time extension has not been agreed upon.

8.3.2 Should Contractor be obstructed or delayed in the commencement, prosecution or completion of the Work, without fault on its part, by reason of failure to act, direction, order, neglect, delay or default of the Owner or the Architect; by changes in the Work; fire, lightning, earthquake, enemy action, act of God or similar catastrophe; by Government restrictions with respect to materials or labor, or by an industry-wide strike beyond Contractor's reasonable control, then Contractor shall be entitled to an extension of time lost by reason of any and all causes aforesaid, but no claim for extension of time on account of delay shall be allowed unless a claim in writing therefore is presented to Architect with reasonable diligence but in any event not later than fourteen (14) days after the commencement of such claimed delay. Except for the causes specifically listed above in this subparagraph, no other cause or causes of delays shall give rise to an extension of time to perform the Work. The granting of an extension of time is conditioned upon Contractor's timely submission of the aforesaid written notice. Except to the extent, if any,

expressly prohibited by law, Contractor expressly agrees not to make, and hereby waives, any claim for damages, including those resulting from increased labor or material cost, on account of any delay, obstruction or hindrance for any cause whatsoever, whether or not foreseeable and whether or not anticipated including but not limited to the aforescribed causes, and agrees that the sole right and remedy therefore shall be extension of time, provided the requisite condition as to written claim has been met.

8.3.3 Contractor shall not be allowed an extension of time unless Contractor has established to the satisfaction of the Owner and Architect that the delay claimed by Contractor is to a portion of the Work on the critical path of the work schedule.

8.3.4 No monetary recovery may be obtained by Contractor for delay. Time extensions for delay are limited to the specific causes set forth in subparagraph 8.3.2 and, then, only upon compliance with the notice and proof requirements of subparagraph 8.3.1 and 8.3.2.

8.3.5 Under no circumstances will Contractor look to or make a claim against Owner or Architect for the consequences of any delay resulting from directions given or not given by Architect including scheduling and coordination of the Work or resulting from Architect's preparation of Drawings and Specifications or review of Shop Drawings.

ARTICLE 9 - PAYMENTS AND COMPLETION

48. Article 9, Subparagraph 9.3.1.3: Add the following new subparagraph 9.3.1.3 immediately after subparagraph 9.3.1.2 of this Agreement:

9.3.1.3 Until the Contract-scheduled date of Substantial Completion (including authorized adjustment), the Owner shall pay ninety-five (95) percent of the amount due the Contractor on account of progress payments, less an amount necessary to satisfy any claims, liens, or judgments against the Contractor which have not been satisfactorily discharged.

49. Article 9, Subparagraph 9.3.3: Delete the first sentence of subparagraph 9.3.3 in its entirety from this Agreement and use the following sentence in lieu thereof:

The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner either by incorporation in construction or no later than time of payment.

50. Article 9, Subparagraph 9.5.1: In the sixth line of subparagraph 9.5.1, after the words "Architect may", delete the word "also".

51. Article 9, Subparagraph 9.5.1.8: Add the following new clause .8 immediately after subparagraph clause .7 of subparagraph 9.5.1 of this Agreement:

.8 any other breach of this Agreement.

52. Article 9, Subparagraph 9.6.8: Add the following new subparagraph 9.6.8 immediately after subparagraph 9.6.7 of this Agreement:

9.6.8 The Owner shall make no payment to the Contractor after the Contract-scheduled date of Substantial Completion (including authorized adjustments) until the actual date of Substantial Completion.

53. Article 9, Subparagraph 9.7: In the second line of subparagraph 9.7, replace the words "does not" with the words "fails persistently to"; in the fourth line, replace the number "seven" with the number "twenty-one".

54. Article 9, Subparagraph 9.8.5: At the end of subparagraph 9.8.5, add the following language:

The payment shall be sufficient to increase the total payments to 100 percent (100%) of the Contract Sum, less twice the value for incomplete Work and unsettled claims as the Architect shall determine.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

55. Article 10, Subparagraphs 10.1.2, 10.1.3, 10.1.4 and 10.1.5: Redesignate paragraph 10.1 as 10.1.1 and add the following new subparagraphs 10.1.2, 10.1.3, 10.1.4 and 10.1.5 immediately after subparagraph 10.1.1 of this Agreement:

10.1.2 For Asbestos Abatement Contract Work; Environmental Control Contract Work; and Roofing Contract Work, only: Delete references to asbestos in subparagraph 10.3.1.

10.1.3 For, Electrical Contract Work, only: Delete references to polychlorinated biphenyl (PCB) in subparagraph 10.3.1.

10.1.4 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. The Owner, Contractor and Architect shall then proceed in the same manner described in subparagraphs 10.3.1 and 10.3.2.

10.1.5 The Owner shall be responsible for obtaining the services of a licensed laboratory to verify a 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 verify that it has been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and the Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection.

56. Article 10, Subparagraphs 10.2.9 and 10.2.10: Add the following new subparagraphs 10.2.9 and 10.2.10 immediately after subparagraph 10.2.8 of this Agreement:

10.2.9 OSHA. In addition to all requirements set forth herein, all Contractors and Subcontractors who perform any work under this Contract shall fully comply with the provisions of the Federal Occupational Safety and Health Act of 1970 and with any rules and regulations pursuant to the Act. This requirement shall apply continuously and not be limited to normal working hours.

10.2.10 Code Rule 56. In addition to all requirements set forth herein, all Contractors and Subcontractors who perform any Work under this Contract shall fully comply with the provisions of 12 NYCRR Part 56.

57. Article 10, Subparagraph 10.4: Delete subparagraph 10.4 in its entirety from this Agreement and use the following new subparagraph 10.4 in lieu thereof:

10.4 In an emergency affecting life, the Work, or the Owner, or Owner's property, Contractor, without special instructions or authorization from Architect, shall take the

action necessary to deal adequately with such emergency. Notice of any such action shall be given by Contractor to Architect and Owner as soon as is practicable.

ARTICLE 11 - INSURANCE AND BONDS

58. Article 11, Subparagraph 11.1.1: In line 3, after Contract Documents, add: "as provided for by AIA Document A101-2017 Exhibit A which is annexed hereto and made a part hereof."

59. Article 11, Subparagraph 11.1.1: Beginning in the fourth line, replace the phrase "lawfully authorized to do business in the jurisdiction in which the Project is located such" with the following language: "rated A or better by the A.M. Best Company and licensed to do business in the state in which the Project is located such occurrence-based". All insurance purchased by Contractor shall constitute primary insurance and primary coverage for all risks insured and that any other liability insurance that Eisenbach and Ruhnke Engineering, 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.

60. Article 11, Subparagraphs 11.1.1: Add the following new subparagraphs.

11.1.1.1 Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

- .1 Premises Operations (including X, C and U coverages).
- .2 Independent Contractor's Protective.
- .3 Products and Completed Operations.
- .4 Personal Injury Liability with Employment Exclusion deleted.
- .5 Contractual, including specified provisions for Contractor's obligation under paragraph 3.18.
- .6 Owned, non-owned and hired motor vehicles.
- .7 Broad Form Property Damage including Completed Operations.

11.1.1.2 If the General Liability coverages are provided by a Commercial General Liability Policy, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverages required to be maintained after final payment, certified in compliance with subparagraph 9.10.2.

11.1.1.3 The insurance required by subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

1. Worker's Compensation:
 - a. State: Statutory
 - b. Applicable Federal: Statutory
 - c. Employer's Liability: Statutory
2. Comprehensive or Commercial General Liability (including Premises-Operations; Independent Contractors' Protective; Products and Completed Operations; Broad Form Property Damage):
 - a. Bodily Injury:
\$2,000,000 Each Occurrence
\$2,000,000 Aggregate
 - b. Property Damage:
\$2,000,000 Each Occurrence
\$2,000,000 Aggregate

- c. Products and Completed Operations to be maintained for 2 years after final payment: \$2,000,000 Aggregate
 - d. Property Damage Liability Insurance shall provide X, C and U coverage.
 - e. Broad Form Property Damage Coverage shall include Completed Operations.
3. Contractual Liability:
- a. Bodily Injury:
\$2,000,000 Each Occurrence
\$2,000,000 Aggregate
 - b. Property Damage
\$2,000,000 Each Occurrence
\$2,000,000 Aggregate
4. Personal Injury with Employment Exclusion deleted:
\$2,000,000 Aggregate
5. Business Auto Liability (including owned, non-owned, and hired vehicles):
- a. Bodily Injury:
\$2,000,000 Each Occurrence
\$2,000,000 Aggregate
 - b. Property Damage:
\$1,000,000 Each Occurrence
6. If the General Liability coverages are provided by a Commercial Liability policy, the:
- a. General Aggregate shall be not less than \$2,000,000 and it shall apply, in total, to this Project only.
 - b. Fire Legal Liability Limit shall be not less than \$50,000 on any one Fire.
 - c. Premises Medical Expense Limit shall be not less than \$5,000 on any one person.
7. Aircraft Liability (owned and non-owned) when aircraft are used in the performance of the Contract: \$2,000,000 (where applicable).
8. Watercraft Liability (owned and non-owned) when watercrafts are used in the performance of the Contract: \$2,000,000 (where applicable).
9. Umbrella Excess Liability:
\$3,000,000 over primary insurance.
\$50,000 retention for self-insureds hazards, each occurrence.
10. For Contracts involving asbestos or asbestos abatement: In addition to coverages noted above, Asbestos Liability Insurance, in a form acceptable to the Owner and written by an insurance company acceptable to the Owner, shall be provided prior to the commencement of the Work, in the amount of \$2,000,000 per occurrence.

61. Article 11, Subparagraph 11.1.5: Add the following new subparagraph 11.1.5 immediately after subparagraph 11.1.4 of this Agreement:

11.1.5: If the General Liability coverages are provided by a Commercial General Liability Policy, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverages required to be maintained after final payment, certified in compliance with subparagraph 9.10.2

62. Article 11, Subparagraph 11.1.6: Add the following language at the end of subparagraph 11.1.3 of this Agreement:

The Certificates shall be ACORD Form 25S, accompanied by a completed AIA Document G715, Instruction Sheet and Attachment for ACORD Certificate of Insurance. The insurance required by subparagraph 11.1.1 shall be written to name the Owner and the Engineer as additional insureds. The Certificates shall reflect naming the Owner and Engineer as additional insureds and shall require thirty (30) days prior written notice to the Engineer and Owner of cancellation or termination.

63. Article 11, Subparagraph 11.1.7: Add the following new subparagraph 11.1.7 immediately after subparagraph 11.1.6 of this Agreement:

11.1.7 Contractor shall not commence work under this Contract until Contractor has obtained all the insurance required hereunder and until such insurance has been accepted by the Owner, nor on its subcontracts until all similar insurance required of the Subcontractors has been so obtained.

64. Article 11, Subparagraph 11.6: Add the following new subparagraph 11.6:

11.6 The Contractor shall furnish Performance Bonds and Labor and Material Payment Bonds each in the amount of the Contract Price. Bonds shall be written by a company licensed to sell surety bonds in the State of New York and the cost thereof shall be included in the Contract Sum.

11.6.1 The Contractor shall deliver the required bonds to the Owner on or before the execution of the Agreement.

11.6.2 The bonds shall be written on AIA Document A311, February 1970 Edition, Performance Bond and Labor and Material Payment Bond forms.

11.6.3 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

11.6.4 No work shall commence until the Owner has accepted the Bonds. The Owner shall have the right to reject the Contractor for failure to comply by the Contractor and the Contractor shall forfeit any bid security for failure to comply with bonding or insurance requirements.

65. Article 11, Paragraph 11.7: Add the following new paragraph 11.7 to Article 11 of this Agreement:

11.7 APPEARANCE OF COUNSEL

11.7 If an action for bodily injury and/or property damage is commenced against Owner or Architect, which in the opinion of Owner's or Architect's legal counsel or insurance coordinator is covered by the indemnity provisions of paragraph 3.18, Contractor shall, upon Owner's written request, promptly cause Contractor's insurance carrier to have

its attorneys appear timely in the action on behalf of Owner and/or Architect and provide the defense of Owner and/or Architect.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

66. Article 12, Subparagraph 12.2.2.1: Add the following sentence at the end of subparagraph 12.2.2.1 of this Agreement: "The Performance Bond shall remain in full effect and force through this period."

ARTICLE 13 - MISCELLANEOUS PROVISIONS

67. Article 13: Redesignate Paragraph 13 as subparagraph 13.1 and add the following new subparagraphs 13.1.1, 13.1.2 and 13.1.3 :

13.1.1 Specific reference is made to the following sections of the Labor Law and General Municipal Law which apply to the Work under this Contract.

13.1.1.1 Labor Law.

- .1 Section 220 Subd. 2, re: 8 hour day, 40 hour week.
- .2 Section 220, Subd. 3 and 220-d, re: Minimum Rates and Supplements, which are included in the Project Manual.
- .3 Section 220-e, re: Anti-discrimination, including all subparts.
- .4 Section 222-a, re: Prevention of dust hazards.

If in the construction of the work covered by the Contract, a harmful dust hazard is created for which appliances or methods for the elimination of harmful dust hazards have been accepted by the Architect or the Owner, such appliances or methods shall be installed and maintained and effectively operated by Contractor at its sole cost and expense, immediately on notification to the Contractor that such a harmful dust hazard exists.

13.1.1.2 General Municipal Law

- .1 Section 103-d re: Non-collusion. Contractor has subscribed, under penalty as provided by law, that the Contract Sum was arrived at independently, that the Contractor has made no agreement to restrict competition in any manner, and did not, prior to the bid opening, knowingly divulge its bid to any competitors.
- .2 Section 108, re: Workers' Compensation Insurance. This Contract shall be void and of no effect unless the person or corporation making or performing such Contract shall secure compensation for the benefit of, and keep insured during the life of the Contract, such employees, in compliance with the provisions of the Workers' Compensation Law.
- .3 Section 109, re: Non-assignment of Public Contracts. As provided in Section 109 of the General Municipal Law, the Contractor is prohibited from assigning, transferring, conveying, subletting or otherwise disposing of the same, or its right title, or interest therein, or its power to execute such contract to any other person or corporation without the previous consent in writing of the officer, board or agency awarding the contract. If any contractor, to whom any contract is let, granted and awarded, as required by law, by any officer, board or agency in a political subdivision, or of any district therein, shall without the previous written consent specified in subdivision 1 of this section, assign, transfer, convey, sublet

or otherwise dispose of such contract, or its right, title or interest therein, or its power to execute such contract, to any other person or corporation, the officer, board or agency which let, made, granted, or awarded such contract shall revoke and annul such contract, and the political subdivision or district therein, as the case may be, and such officer, board or agency shall be relieved and discharged from any and all liability and obligations growing out of such contract to such contractor, and to the person or corporation to which such contract shall have been assigned, transferred, conveyed, sublet or otherwise disposed of, and such contractor, and its assignees, transferees or sublessees shall forfeit and lose all monies, theretofore earned under such contract, except so much as may be required to pay its employees. The provisions of this section shall not hinder, prevent, or affect any assignment by any such contractor for the benefit of its creditors made pursuant to the laws of this state.

13.1.2. Each and every provision 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 in the event any such provision is not inserted or is not correctly inserted the, upon the application of either party, this Contract shall forthwith be physically amended to make such insertion or corrections.

13.1.3 In the event a dispute arises out of this Contract or which in any way affects the rights of any of the parties to it, the Contractor agrees to bring any action, proceeding or other legal process only in the State court jurisdiction in which the project is located and in no other forum.

68. Article 13, Paragraphs 13.6 and 13.7: Add the following new paragraphs 13.6 and 13.7 to Article 13 of this Agreement:

13.6 EQUAL OPPORTUNITY

13.6.1 The Contractor shall maintain policies of employment as follows:

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

13.6.1.2 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 considerations for employment without regard to race, religion, color, sex or national origin.

13.6.1.3 Affirmative Action Requirements - Equal Opportunity Employment. Contractor shall adhere to any local and applicable Affirmative Action, Equal Opportunity Employment Programs in the area of work. (If no quota is required in the area of this project, Affirmative Action requirements do not apply).

13.7 EQUIVALENTS

13.7.1 In the Specifications, where two or more kind, types, brands, or manufacturers of materials are named, they are regarded as the required standard of quality, and are presumed to be equal. The Contractor may select one of these items or, if the Contractor desires to use any kind, type, brand, or manufacturer or material other than those named in the Specifications, Contractor shall indicate in writing, in accordance with the procedures outlined, what kind, type, brand, or manufacturer is proposed.

13.7.2 In the Specifications, the absence of an "or equal" clause is not meant to exclude competition.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

69. Article 14, Subparagraphs 14.2.1.5 through 14.2.1.12: Add the following new clauses .5 through .12 immediately after clause .4 of subparagraph 14.2.1 of this Agreement:

- .5 is more than 15 percent behind schedule, as measured by dividing the number of days behind schedule, as determined by the Architect jointly with the Owner, divided by the total number of days in the Work;
- .6 refuses or neglects to supply a sufficient quantity of materials or labor required to perform the Work according to accepted schedules;
- .7 fails to prosecute the Work with diligence and promptness;
- .8 files for bankruptcy or other debtor insolvency relief;
- .9 an act or omission by Contractor which stops, delays, interferes with, or damages the Work;
- .10 any other failure by Contractor to perform any other terms and conditions of the Contract;
- .11 a determination by Owner or Architect that the Work or any portion of the Work is not being performed in accordance with the Contract; or
- .12 disregards the authority of the Owner.

70. Article 14, Subparagraph 14.2.2: In the fourth line of subparagraph 14.2.2, after the word "notice", add the following language: "or three days' written notice, if the number of days between the date of commencement and date of Substantial Completion, including both those days, is thirty (30) days or less,".

ARTICLE 15 CLAIMS AND DISPUTES

71. Article 15, Subparagraph 15.1.2: Delete this Subparagraph 15.1. in its entirety.

DRAFT AIA® Document A101® – 2017

Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

for the following **PROJECT**:
(Name and location or address)

« »
« »

THE OWNER:
(Name, legal status and address)

« »
« »

THE CONTRACTOR:
(Name, legal status and address)

« »
« »

TABLE OF ARTICLES

- A.1 GENERAL
- A.2 OWNER'S INSURANCE
- A.3 CONTRACTOR'S INSURANCE AND BONDS
- A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

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 Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

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§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 **Causes of Loss.** The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:

(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 **Specific Required Coverages.** The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:

(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 **Deductibles and Self-Insured Retentions.** If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 **Occupancy or Use Prior to Substantial Completion.** The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

- [☐] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

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- [☐] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

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- [☐] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

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- [☐] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

<< >>

- [☐] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

<< >>

- [☐] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

<< >>

- [☐] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance; including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

<< >>

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[« »] § A.2.5.1 **Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

« »

[« »] § A.2.5.2 **Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage

Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 **Certificates of Insurance.** The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 **Deductibles and Self-Insured Retentions.** The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 **Additional Insured Obligations.** To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than « » (\$ « ») each occurrence, « » (\$ « ») general aggregate, and « » (\$ « ») aggregate for products-completed operations hazard, providing coverage for claims including

- .1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- .2 personal injury and advertising injury;
- .3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- .4 bodily injury or property damage arising out of completed operations; and

.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- .1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- .2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- .3 Claims for bodily injury other than to employees of the insured.
- .4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
- .5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- .6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- .7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
- .8 Claims related to roofing, if the Work involves roofing.
- .9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- .10 Claims related to earth subsidence or movement, where the Work involves such hazards.
- .11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than « » (\$ « ») per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than « » (\$ « ») each accident, « » (\$ « ») each employee, and « » (\$ « ») policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than « » (\$ « ») per claim and « » (\$ « ») in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than « » (\$ « ») per claim and « » (\$ « ») in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « » (\$ « ») per claim and « » (\$ « ») in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than « » (\$ « ») per claim and « » (\$ « ») in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than « » (\$ « ») per claim and « » (\$ « ») in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

- [« »] § A.3.3.2.1 Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

« »

- [« »] § A.3.3.2.2 **Railroad Protective Liability Insurance**, with policy limits of not less than « » (\$ « ») per claim and « » (\$ « ») in the aggregate, for Work within fifty (50) feet of railroad property.
- [« »] § A.3.3.2.3 **Asbestos Abatement Liability Insurance**, with policy limits of not less than « » (\$ « ») per claim and « » (\$ « ») in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.
- [« »] § A.3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.
- [« »] § A.3.3.2.5 Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.
- [« »] § A.3.3.2.6 **Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage**Limits****§ A.3.4 Performance Bond and Payment Bond**

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:

(Specify type and penal sum of bonds.)

Type

Penal Sum (\$0.00)

Payment Bond

Performance Bond

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

« »

SECTION 01 1000
SUMMARY OF CONTRACTS

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Warwick Central School District High School Renovations, Field Work, Roofing and Exterior Bathroom Building.
- B. Owner's Name: Warwick Valley Central School District.
- C. Engineer's Name: Eisenbach and Ruhnke Engineering, P.C.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: Multiple prime contracts, each based on a Stipulated Price as described in Document 00 5000 - Contracting Forms and Supplements.
- B. The work of each separate prime contract is identified in this section and on the Drawings.
 - 1. Contract #1 is for General Construction
 - a. The project includes renovations to the lobby, cafeterias server and kitchen and construction of a new bathroom building near the fields.
 - 2. Contract #2 is for Electrical Work
 - a. The electrical work to be under contract is for the work in the cafeteria/server/kitchen and lobby and Bathroom building.
 - b. The electrical work for the chiller and the field lighting is by the District.
 - 3. Contract #3 is for Plumbing Work
 - a. The plumbing work is for the work in the new bathroom building.
 - b. The work for the irrigation system is by the Field Contractor.
 - c. The well is being provided by the District.
 - 4. Contract #4 is for HVAC
 - a. The work includes replacement of the chiller and providing HVAC work for the Kitchen/Cafeterias/Servery and Lobby and the exhaust in the new bathroom building.
 - 5. Contract #5 is for Fields
 - a. The field work includes reconstruction of the field, field event areas and track including drainage, paving, fencing, and irrigation.
 - 6. Contract #6 is for Roofing
 - a. Replace approximately 15,000 sq.ft. of roofing, coordinating with the HVAC work being done on the roof and including asbestos abatement indicated. The work includes temporary roofing to facilitate the HVAC work being done and anticipated late delivery of roofing materials.

1.04 OWNER OCCUPANCY

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.05 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. Owner occupancy.
 - 2. Work by Others.
 - 3. Work by Owner.
- C. Provide access to and from site as required by law and by Owner:
 - 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 permit.
- D. Existing building spaces may not be used for storage unless authorized by Owner.

- E. Storage is limited on the site. Contractors should assume that storage will be in containers they provide.
- F. Contractors are not allowed to use any materials or equipment belonging to the District, including, but not limited to, ladders, carts, brooms, garbage cans, etc. Use of a District owned ladder will result in the worker being permanently removed from the site.
- G. Contractors are responsible for their own clean up. Rooms are to be left as clean as found. If the District has to arrange for cleaning, the contractors will be back charged. During the summer, contractors can work as many hours as desired.
- H. Work hours:
 - 1. 7:00 AM - 5:00 PM
- J. Utility Outages and Shutdown:
 - 1. Limit disruption of utility services to hours the building is unoccupied.
 - 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days' notice to Owner and authorities having jurisdiction.
 - 3. Prevent accidental disruption of utility services to other facilities.

1.06 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Engineer and Construction Manager/Owners Representative.

1.07 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

- A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.
- B. Section 01 2000 - Price and Payment Procedures.
- C. Section 01 2100 - Allowances.
- D. Section 01 3000 - Administrative Requirements.
- E. Section 01 4000 - Quality Requirements.
- F. Section 01 4216 - Definitions.
- G. Section 01 4219 - Reference Standards.
- H. Section 01 5000 - Temporary Facilities and Controls.
- I. Section 01 6000 - Product Requirements.
- J. Section 01 7000 - Execution and Closeout Requirements.
- K. Section 01 7800 - Closeout Submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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 final payment.

1.03 RELATED REQUIREMENTS

- A. Section 00 5200 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.
- B. Section 00 7200 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.
- C. Section 01 2100 - Allowances: Payment procedures relating to allowances.

1.04 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G702/703.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Engineer for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date Letter of Award.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.

1.05 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form Identical form approved for Schedule of Values.
- C. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- D. Execute certification by signature of authorized officer.
- E. 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.
- F. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- G. Submit one (1) electronic "pencil copy", in PDF format, of each Application for Payment to Eisenbach & Ruhnke Engineering, P.C. for approval.
- H. After Engineer's approval of the "pencil copy" submit three hard copies to Eisenbach & Ruhnke

- I. Include the following with the 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.
 - 4. When an application shows completion of an item, submit final or full waivers.
 - 5. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 6. 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.
 - 7. Certified Payrolls; All Applications for Payment must be accompanied with certified payrolls for all Contract Work performed. In addition, 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 Owners 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.
- J. 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
- K. Project record documents as specified in Section 01 7800, shall be available for review by Warwick CSD as a prerequisite for approval of payment.
- L. Affidavits attesting to off-site stored products and insurance certificates covering all site material and equipment.
- M. When Eisenbach and Ruhnke Engineering, 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.
- N. The Owner shall retain Five (5) percent of the amount of each payment

1.06 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

- A. Comply with Requirements of Section 01 7800 - Closeout Submittals.

1.07 MODIFICATION PROCEDURES

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.
- B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Engineer will issue instructions directly to Contractor.
- C. For other required changes, Engineer will issue a document signed by Owner 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.
- D. For changes for which advance pricing is desired, Engineer will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 2 days.
- E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

1. For change requested by Engineer for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Engineer.
 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 4. For change ordered by Engineer without a quotation from Contractor, the amount will be determined by Engineer based on the Contractor's substantiation of costs as specified for Time and Material work.
- F. 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:
- G. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- H. 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.
- I. 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.
- J. Promptly enter changes in Project Record Documents.

1.08 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.

1.09 APPLICATION FOR PAYMENT AFTER SCHEDULED COMPLETION DATE

- A. In the event the work is not completed by the schedule date, listed in Section 01100 Summary of Work, and in addition to the other remedies described, the Engineer 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 5% retainage.

1.10 APPLICATION FOR FINAL PAYMENT

- A. It is understood by the Contractor that the maximum payment due the contractor prior to final payment shall be Ninety-Five (95%) of the Contract amount and the final Five (5%) will be due only after the completion and submittal of all requirements of Section 01780 Closeout Submittals are met, including completion of all "punch list" items.
- B. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 01 7000.
 2. All "punch list" items have been completed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 2100
ALLOWANCES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Contingency allowance.
- B. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

- A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CONTINGENCY ALLOWANCE

- A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- B. Funds will be drawn from the Contingency Allowance only by Change Order.
- C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 ALLOWANCES SCHEDULE

- A. CONTRACT #1 GENERAL CONSTRUCTION
 - 1. ALLOWANCE
 - a. Include an allowance for use according to the Owner's instructions
Thirty Thousand (\$30,000) DOLLARS
- B. CONTRACT #2 ELECTRICAL
 - 1. ALLOWANCE
 - a. Include an allowance for use according to the Owner's instructions
Thirty Thousand (\$30,000) DOLLARS
- C. CONTRACT #3 PLUMBING
 - 1. ALLOWANCE
 - a. Include an allowance for use according to the Owner's instructions
Twenty Thousand (\$20,000) DOLLARS
- D. CONTRACT #4 HVAC
 - 1. ALLOWANCE
 - a. Include an allowance for use according to the Owner's instructions
Thirty Thousand (\$30,000) DOLLARS
- E. CONTRACT #5 FIELDS AND IRRIGATION
 - 1. ALLOWANCE
 - a. Include an allowance for use according to the Owner's instructions
Thirty Thousand (\$30,000) DOLLARS
- F. CONTRACT #6 ROOFING
 - 1. ALLOWANCE
 - a. Include an allowance for use according to the Owner's instructions
Twenty Thousand (\$20,000) DOLLARS

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Construction progress schedule.
- D. Coordination drawings.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 00 7200 - General Conditions: Dates for applications for payment.
- B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 PROJECT/CONSTRUCTION MANAGER

- A. Project Manager: Eisenbach & Ruhnke Engineering, P.C.
- B. Cooperate with the Project/Construction Manager in allocation of mobilization areas of site; for field offices and sheds, for building access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Manager.
- D. Comply with Project/Construction Manager'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 Project/Construction Manager for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary of Contracts.
- F. Coordinate field engineering and layout work under instructions of the Project Manager.
- G. Make the following types of submittals to Engineer through the Project Manager:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Engineer will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Engineer.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing the parties to Contract, Owner and Engineer.

6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 7. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

- A. Engineer will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- B. Attendance Required:
1. Contractor.
 2. Owner.
 3. Engineer.
 4. Contractor's superintendent.
 5. Major subcontractors.
- C. 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. Maintenance of progress schedule.
 7. Corrective measures to regain projected schedules.
 8. Planned progress during succeeding work period.
 9. Maintenance of quality and work standards.
 10. Effect of proposed changes on progress schedule and coordination.
 11. Other business relating to work.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.04 COORDINATION DRAWINGS

- A. Provide information required by Project Manager for preparation of coordination drawings.

3.05 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
1. Product data.
 2. Shop drawings.
 3. Samples for selection.
- B. Submit to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.

- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.06 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Engineer's knowledge as contract administrator or for Owner.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in conformance to requirements of Section 01 7800 - Closeout Submittals:
1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Engineer.
1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.09 SUBMITTAL PROCEDURES

- A. General Requirements:
- B. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
 2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.
- C. Transmit each submittal with a copy of approved submittal form.
- D. Transmit each submittal with approved form.
- E. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- F. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- G. Apply Contractor's stamp, signed or initialed 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.
- H. Schedule submittals to expedite the Project, and coordinate submission of related items.

- I. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- J. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- K. Provide space for Contractor and Engineer review stamps.
- L. When revised for resubmission, identify all changes made since previous submission.
- M. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- N. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01 3060
NON-DISCRIMINATION CLAUSES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.
- B. 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.
 - a. 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.
 - b. 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.
 - c. 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.

- d. 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.
- e. 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 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.

1.02 RELATED SECTIONS

- A. Section 01 1000 - Summary of Contract(s): Work sequence.

1.03 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.
- D. Submit updated schedule with each Application for Payment.
- E. Submit under transmittal letter form specified in Section 01 3000 - Administrative Requirements.

1.04 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one year's 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 CPM schedules on comparable projects.

1.05 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Diagram Sheet Size: Maximum 22 x 17 inches.
- C. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- D. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first workday of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Engineer 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, and resubmit within 10 days.

3.05 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. Annotate 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.

3.06 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Engineer, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 3300
SED SPECIAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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.

1.03 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.

1.04 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.

1.05 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 workday. School buildings occupied during a construction project shall maintain required health, safety, and educational capabilities at all times that classes are in session.

1.06 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. Contractor shall maintain existing fire extinguishers.
- D. Fire alarm and smoke detection systems shall remain in operation at all times.

1.07 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 contaminants produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes.
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.

1.08 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 noncombustible 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.

1.09 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 Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for electrical installation if applicable.

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 Engineer.

1.12 CONSTRUCTION WORKER 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 provide 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 3323

SHOP DRAWINGS, SUBMITTALS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Requirements Specified Elsewhere
 - 1. Section 01 3000 Administrative Requirements
- B. Submit, to the Engineer, shop drawings, product data, and samples required by the specification sections.
- C. Attached is the Submittal Cover Sheet (Section 01 3323.01) that is to be filled out and returned to the Engineer with each submittal.
- D. Make submittals to allow for checking, re-submittal, and rechecking, if required, without causing delay of the Construction Schedule.

1.02 PRODUCT DATA

- A. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, and other standard descriptive data.
 - 1. Modify product data to delete information that is not applicable to project.
 - 2. Supplement standard to provide additional information applicable to project.
 - 3. Clearly mark each copy to identify applicable materials, products, or models.
 - 4. Show dimensions and clearances required.
 - 5. Show performance characteristics and capacities.
 - 6. Show wiring or piping diagrams and controls.

1.03 CONTRACTOR RESPONSIBILITIES

- A. Review, approve, stamp, and sign shop drawings, submittals, product data, and samples prior to submission to Engineer.
- B. Verify:
 - 1. Field measurements.
 - 2. Field construction criteria.
 - 3. Catalog numbers and other data.
- C. Coordinate each submittal with requirements of Work and Contract Documents.
- D. Contractor's responsibility for errors and omissions in submittals is not relieved by Engineer's review of submittals.
- E. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Engineer's review of submittals unless Engineer gives written acceptance of the specific deviations.
- F. Notify Engineer in writing, at time of submission, of deviations in submittals from requirements of Contract Documents.
- G. After Engineer's review, Contractor is to distribute copies of submittals to parties requiring same for co-ordination of work.
- H. Make required copies for distribution of shop drawings and product data that have been stamped and signed by the Engineer.

1.04 SUBMISSION REQUIREMENTS

- A. Submit number of copies of product data that will be required for distribution plus one copy that will be retained by Engineer.
- B. Accompany submittal with transmittal letter, containing:
 - 1. Date.
 - 2. Engineer's project title and number.
 - 3. Contractor's name and address.
 - 4. Notification of deviations from Contract Documents.

5. Additional pertinent data.
- C. Submittals shall include:
 1. Date and revision dates.
 2. Engineer's project title and number.
 3. The names of:
 - a. Engineer.
 - b. Contractor.
 - c. Subcontractor.
 - d. Supplier.
 - e. Manufacturer.
 4. Identification of product.
 5. Relation to adjacent structure or materials.
 6. Field dimensions clearly identified as such.
 7. Technical Specification section number.
 8. Applicable standards.
 9. A blank space, 4 x 4 inches, for the Engineer's stamp.
 10. Identification of deviations from Contract Documents.
 11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements, and compliance with Contract Documents.
 - a. Submittals without Contractor's stamp will be returned without being reviewed.
- D. Shop Drawing Submittal Cover Sheet
 1. Attach submittal cover sheet, with all blanks filled in for each shop drawing, product data, and sample.

1.05 RESUBMISSION REQUIREMENTS

- A. Product Data and Samples: Submit new data and samples as required for initial submittal.

1.06 CONTRACTOR'S DISTRIBUTION OF SUBMITTALS

- A. Distribute copies of shop drawings and product data that carry the Engineer stamp to:
 1. Contractor's file.
 2. Job site file.
 3. Record Document file.
 4. Construction Manager.
 5. Owner
- B. Distribute samples as directed by Engineer.

1.07 ENGINEER

- A. Stamp and initial or sign certifying to review of submittal.
- B. Explanation of Engineer's Stamp:
 1. NO EXCEPTION TAKEN: No corrections, no marks.
 2. MAKE CORRECTIONS NOTED: Minor amount of corrections; all items can be fabricated at Contractor's risk without further correction; checking is complete and all corrections are obvious without ambiguity.
 3. REVISE AND RESUBMIT: Minor amount of corrections; noted items must not be fabricated without further correction; checking is not complete; details of items noted by checker are to be further clarified; items not noted to be corrected can be fabricated at Contractor's risk under this stamp.
 4. REJECTED: Drawings are rejected as not in accordance with the Contract, too many corrections, or other justifiable reason. The drawing must be corrected and resubmitted. No items are to be fabricated under this stamp.
 5. SUBMIT SPECIFIED ITEM: Item is not as specified. Submit named manufacturer.
- C. Return submittals to Contractor for distribution.

1.08 SUBMITTALS REQUIRED FOR REVIEW

- A. The following is the Submittal Cover Sheet for the required submittals. Contractor is responsible for reviewing each section to determine required submittals.

END OF SECTION

SUBMITTAL COVER SHEET



EISENBACH & RUHNKE ENGINEERING, P.C.

291 Genesee St., Utica, NY 13501 315-735-1916

The Contractor shall fill out lines 1 through 7 below and staple this cover sheet to submitted product data sheet, sample, shop drawing, or other items submitted to the Architect/Engineer. Each submittal shall have its own Submittal Cover Sheet.

Project Name: Warwick Valley School District
High School Renovations, Field Work,
Roofing and Exterior Bathroom Building

Contractor:

E&R Project No.: 05-21-04 and 05-20-06

Project Manager:

Address:

Email Submittals to: jeisenbach@erengpc.com
jjouben@erengpc.com
acorrell@erengpc.com

Phone:

Architect/Engineer: Eisenbach and Ruhnke Engineering, P.C.
Project Manager: Jack Eisenbach jeisenbach@erengpc.com,
John Jouben jjouben@erengpc.com
Address: 291 Genesee Street
Utica, NY 13501
Phone: 315-735-1916

Owner: Warwick Valley Central School District

1. Date: _____
2. Submittal Number: _____
3. Submitted Item: _____
4. Manufacturer: _____
5. Person Submitting: _____
6. Spec. Location: Section _____ Article _____ Paragraph _____ Subparagraph _____
7. And/Or Drawing Number: _____

Architect/Engineer's Notes: _____

Contractor's Stamp

Architect/Engineer's Stamp

- ☐ No exception taken.
- ☐ Make Corrections Noted. Do not resubmit. See Notes above.
- ☐ Submit Specified Item. Resubmit. See Notes above.
- ☐ Revise and Resubmit. Resubmit. See Notes above.
- ☐ Rejected. See Notes above.

Checking of submittals is only for general conformance with the design concept of the Project and general compliance with the information given in Contract Documents. Any action shown is subject to the requirements of the Drawings and Specifications. Contractor is responsible for dimensions to be confirmed and correlated at the job site, quantities, information that pertains solely to the fabrication processes or to techniques of construction, coordination of the work of all trades, and the satisfactory performance of his work.

By: _____ Date: _____
EISENBACH & RUHNKE ENGINEERING

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Manufacturers' field services.
- F. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 3000 - Administrative Requirements: Submittal procedures.
- C. Section 01 4216 - Definitions.
- D. Section 01 4219 - Reference Standards.
- E. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. 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.
- B. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Engineer's knowledge and action as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
 - 1. Include required product data and shop drawings.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Engineer and to Contractor.
 - 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. Conformance with Contract Documents.
 - k. When requested by Engineer, provide interpretation of results.
 - 2. Test report submittals are for Engineer's knowledge as construction contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer, in quantities specified for Product Data.

1. Indicate material or product conforms to 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 Engineer.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Engineer's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.
- G. Erection Drawings: Submit drawings for Engineer's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
 2. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.05 REFERENCES AND STANDARDS

- A. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- B. Obtain copies of standards where required by product specification sections.
- C. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

1.06 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- B. Contractor Employed Agency:
 1. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 2. Laboratory: Authorized to operate in the State in which the Project is located.
 3. 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

3.01 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 Engineer 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.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TESTING AND INSPECTION

- A. Testing Agency Duties:

1. Provide qualified personnel at site. Cooperate with Engineer and Contractor 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 Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 5. Perform additional tests and inspections required by Engineer.
 6. Submit reports of all tests/inspections specified.
- 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 Contractor.
 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Engineer.
- E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.03 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, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.04 DEFECT ASSESSMENT

- A. Replace work or portions of the work not conforming to specified requirements.

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY OF REFERENCE STANDARDS

- A. Regulatory requirements applicable to this project are the following:
- B. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.
- C. NFPA 101 - Life Safety Code; 2020.

1.03 CODES, PERMITS, FEES, ETC.

- A. The Owner shall file and obtain the Building Permit.
- B. Each Contractor shall furnish and pay for all 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 finish all certificates necessary to the Construction Manager/Owner as evidence that the work installed under this Section of the Specifications conforms with all applicable requirements of the Municipal and Stat Codes, National Board of Fire Underwriters, National Electric Code.
- C. Any items of work specified herein and shown on the drawings which conflict with aforementioned rules, regulations and requirements, shall be referred to the Engineer and Construction Manager/Owner for decision which decision shall be final and binding.
- D. The work shall not be deemed to have reached a state of completion until the certificates have been delivered.
- E. The building is to be constructed under the following Rules and Regulations of the New York State Uniform Fire and Building Codes known as the "Building Codes of the State of New York" and consists of the following:
 - 1. Building Code of New York State
 - 2. State Education Department Planning Standards, including Commissioner's Regulation Part 155.5, 155.7
 - 3. Energy Conservation Construction Code of the New York State
 - 4. Fire Code of New York State
 - 5. Fuel Gas Code of New York State
 - 6. Mechanical Code of New York State
 - 7. Plumbing Code of New York State.
- F. Classification of Construction
- G. Occupancy Classification: Education E
- H. 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 website.
- I. Electrical Certification: The Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for electrical installation.
- J. OSHA Part 1926 Safety and Health Regulations for construction.

1.04 MANDATORY OSHA CONSTRUCTION SAFETY AND HEALTH TRAINING

- A. All laborers, workers and mechanics working on the site are required to be certified as having 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.

1.05 RELATED REQUIREMENTS

- A. Section 01 4000 - Quality Requirements.
- B. Section 01 4219 - Reference Standards.

1.06 QUALITY ASSURANCE

- A. 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 Building Name and Address.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4216

DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

- A. Furnish: To supply, deliver, unload, and inspect for damage.
- B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. 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.
- D. Provide: To furnish and install.
- E. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4219
REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements relating to referenced standards.

1.02 RELATED REQUIREMENTS

- A. Document 00 7200 - General Conditions: Reference standards.

1.03 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue specified in this section, except where a specific date is established by applicable code.
- C. Obtain copies of standards when required by the Contract Documents.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from the Engineer before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Engineer shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

1.04 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract and Section 01 1000 Summary of Contracts.

1.05 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents, including reference standards in codes having jurisdiction, include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Engineer for a decision before proceeding.
- C. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
- D. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source and make them available on request.

PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

2.01 ABBREVIATIONS AND NAMES:

- A. Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

PART 3 – NOT APPLICABLE

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Security requirements.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.
- G. Project identification sign.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 for submittals

1.03 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Mobile phone service for all field superintendents and foreman.

1.04 BARRIERS

- A. 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 demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.05 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.06 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.07 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.08 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on drawings.

- B. Erect on site at location indicated.
- C. No other signs are allowed without Owner permission except those required by law.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5060

SITE SAFETY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY:

- A. The purpose of this section is to specify 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 of 1970 (OSHA) and the Construction Safety Act of 1969, 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, the Engineer, and all their employees, consultants and representatives harmless from and against and shall indemnify each and every one 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.

1.03 RELATED SECTIONS

- A. Section 01 5000 - Temporary Facilities and Controls.

1.04 DEFINITIONS

- A. Public shall mean anyone not involved with or employed by the contractor to perform the duties of this contract.
 - 1. Site shall mean the limits of the work area.
 - 2. Contractor shall mean the contractor, his/her subcontractors and any other person related to the contract execution.

1.05 REFERENCES:

- A. Code of Federal Regulations OSHA Safety and Health.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Barriers shall be constructed of sturdy lumber having a minimum size of 2'x 4'.
- B. Signs shall be made of sturdy plywood of 1/2" minimum thickness and shall be made to legible at a distance of 50 feet.

PART 3 - EXECUTION

3.01 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, at their own expense, provide temporary structures, place watchmen, design and erect barricades, fences, and railings, give warnings, display such lights, signals and signs, exercise such precautions against fire, adopt and enforce such rules and regulations, and take such other precautions as may be necessary, desirable or proper or as may be directed.
 - 2. 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 ensure 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 clean up the site daily and keep the site free of debris, refuse, rubbish, and scrap materials. The site shall be kept in a neat and orderly fashion. Before the termination of the contract, each Contractor shall remove all surplus materials, falsework, temporary fences, temporary structures, including foundations thereof.
- F. 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 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage, and protection.
- C. Product option requirements.
- D. Substitution limitations.

1.02 RELATED REQUIREMENTS

- A. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.

2.02 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- B. A request for substitution 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.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. 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 Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.

3.02 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.

3.03 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.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. 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 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 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, Electronic document submittal service.
- C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. 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 Owner or separate Contractor.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
 - 1. Minimum of 3 years of documented experience.

1.06 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: 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.
- C. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

3. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.07 COORDINATION

- A. 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, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- 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. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. 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.

3.02 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.

3.03 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 Engineer four 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 two copies to Engineer, Owner, participants, and those affected by decisions made.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. 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.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 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 Engineer before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. 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.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 - 4. Verify that abandoned services serve only abandoned facilities.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment, 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.
- D. 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.
- E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
- F. 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.
- G. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- H. Clean existing systems and equipment.
- I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- J. Do not begin new construction in alterations areas before demolition is complete.
- K. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. 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-conforming work.
- D. 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.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. 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.
- J. Patching:
1. 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.
 2. Match color, texture, and appearance.
 3. 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.

3.07 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.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. 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.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. 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.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.

- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Engineer when work is considered ready for Engineer's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Engineer's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Engineer.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Engineer when work is considered finally complete and ready for Engineer's Substantial Completion final inspection.
- H. Complete items of work determined by Engineer listed in executed Certificate of Substantial Completion.

END OF SECTION

SECTION 01 7329
CUTTING AND PATCHING

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Related Requirements Specified Elsewhere
 - 1. Summary of Contract: Section 01 1000.
- B. Cutting and patching covers adjustment to, and necessary reworking of, elements of construction in existing work. The following definitions for cutting and patching apply to this Contract.
 - 1. Cutting: Physical modification of existing construction work, or removal of existing materials.
 - 2. Patching: Restoration or replacement and installation of construction material, both new and existing, including finishing and patching.
- C. Execute cutting, fitting, or patching of work, required to:
 - 1. Install specified work in existing construction.
 - 2. Remove existing construction.
 - 3. Provide equipment, labor, and incidentals necessary for cutting and patching as required for the installation of work in existing walls, floors, and ceilings. Patching must match adjacent material and finish.
- D. Coordination
 - 1. Coordinate the Work to minimize cutting and patching.
- E. In addition to Contract requirements, upon written instructions of Engineer:
 - 1. Uncover work to provide for Engineer's observation of covered work.
 - 2. Remove samples of installed materials for testing.
- F. Do not endanger work by cutting or altering work or any part of it.

1.02 SUBMITTALS

- A. Should conditions of work, or schedule, indicate change of materials or methods, submit written recommendation to Engineer, including:
 - 1. Conditions indicating change.
 - 2. Recommendations for alternative materials or methods.
 - 3. Submittals as required for substitutions.
- B. Submit written notice to Engineer designating time work will be uncovered, to provide for observation.

1.03 PAYMENT FOR COSTS

- A. Costs caused by ill-timed or defective work, or work not conforming to Contract Documents, including costs for additional service of Engineer will be paid for by the party responsible for ill-timed, rejected, or non-conforming work.

PART 2 – PRODUCTS

2.01 MATERIALS FOR REPLACEMENT OF WORK REMOVED

- A. Comply with specifications for type of work to be done.
- B. Match existing adjoining materials.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Inspect existing condition of work including elements subject to movement or damage during removal of adjacent materials.

3.02 PREPARATION

- A. A. Prior to Cutting
 - 1. Provide shoring, bracing, and support as required to maintain structural integrity of project.
 - 2. Provide protection for materials on adjacent surfaces.
 - 3. Provide protection when work will be exposed to the elements.

3.03 PERFORMANCE

- A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances and finishes.
- B. Restore work that has been cut or removed. Provide new products to complete work in accordance with requirements of Contract Documents.
- C. Refinish entire surfaces as necessary to provide an even finish.
 - 1. Continuous Surfaces: To nearest intersections.
 - 2. Assembly: Entire refinishing.
- D. Fill and patch openings and holes in existing construction when bolts, piping, ducts, conduit, and other pen-etrating items are removed.

END OF SECTION

SECTION 01 7330
SELECTIVE REMOVALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.02 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. The Contractor shall provide all-inclusive removals required for new and renovated work.
 - 1. The Contractor will be responsible for all related removals and re-work of the existing systems, as required for new work.

1.03 SUMMARY

- A. This Section includes but is not limited to the following:
 - 1. Demolition and removals of selected portions of a building or structure.
 - 2. Repair procedures for selective removals operations.
 - 3. Patching of all areas of cutting and removals.

1.04 RELATED SECTIONS

- A. Section 01 4000 - Quality Requirements: Testing and inspection procedures
- B. Section 01 5000 - Temporary Facilities and Controls
- C. Section 01 7419 - Construction Waste Management and Disposal

1.05 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. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvages, or removed and reinstalled.
 - 1. Protect construction indicated to remain against damage and soiling during selective removals.
- C. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished shall become Contractor's property and shall be removed from the Project site.
- D. Removal and Reinstall: Each item from existing construction, prepare them for reuse, and reinstall them where indicated.

1.06 SUBMITTALS

- A. 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.
- B. Schedule of selective removals Activities: Indicate the following:
 - 1. Detailed sequence of selective removals and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
- C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.07 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective removals. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Pre demolition Conference: Conduct 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 demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective removals schedule and verify availability of materials, demolitions, personnel equipment, and facilities needed to make progress and avoid delays.

1.08 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective removals area. Conduct selective removals so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
 2. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- B. Owner assumes no responsibility for condition of areas to be selectively demolished.
- C. Hazardous Materials: Hazardous materials are present in building. A report on the presence of hazardous materials is attached. Examine report to become aware of locations where hazardous materials are present.
 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

1.09 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective removals, by methods and with materials so as not to void existing warranties.
 1. Existing roofing is under warranty. Remove material by sub-contractors authorized and approved by manufacturer.

PART 2 - PRODUCTS

2.01 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 2. Use materials whose installed performance equals or surpasses that of existing materials.
 3. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of selective removals required.
- B. 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 Engineer.

3.02 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective removals and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- C. Protect existing site improvements, appurtenances, and landscaping to remain.
- D. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- E. Provide protection to ensure safe passage of people around selective removals area and to and from occupied portions of building.

- F. Provide temporary weather protection, during interval between selective removals of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
- G. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective removals operations.
- H. Cover and protect furniture, furnishings, and equipment that have not been removed.
- I. 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.
- J. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
- K. The following procedures shall be followed when door, frames, flooring, and roofing are removed and do not contain asbestos:
 - 1. Asbestos and lead containing material shall be removed as per asbestos and lead abatement sections of the specifications.
 - 2. Work must be in compliance with OSHA Construction Standard (29 CFR 1926.62).
 - 3. Windows directly below, above, and adjacent to the work area shall be closed.
 - 4. Provide tarps on the floor of the space to catch all dust, debris etc are being removed
 - 5. All existing casework, furniture, books, computers and similar shall be provided one layer of six mil plastic.
 - 6. All air vents in the room shall be closed and/or shut off and sealed.
 - 7. Access to all rooms undergoing removals shall be restricted to prevent unauthorized entry.
 - 8. 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 Engineer.
 - 9. Contractor shall provide labor for daily cleanup on the interior and exterior of the building as required or directed by the Owner's Representative. Any visible debris shall be removed daily. Only wet cleaning methods and/or HEPA vacuuming shall be used to clean.
 - 10. All debris disposed of properly in accordance with Federal, State and Local Regulations. Refer to Section 01 50 00 "Temporary Facilities" for containers required.
 - 11. At completion of the work in each area the area shall be HEPA vacuumed and wet wiped.
 - 12. All corridors used by Contractors shall be protected and mopped and left clean daily

3.03 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
- B. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- D. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- E. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective removals operations. Return adjacent areas to condition existing before selective removals operations began.

3.04 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. Locate selective removals equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 2. Dispose of demolished items and materials promptly.

3. Existing Facilities: Comply with Owner's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective removals operations.
4. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective removals. When permitted by Engineer, 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.
5. Roofing: Remove no more existing roofing than can be covered in one day by new roofing. Refer to applicable Division 7 Section for roofing requirements.

3.05 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by selective removals operations.
 1. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
 2. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
 3. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
 4. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.07 CLEANING

- A. Sweep the building broom clean on completion of selective removals operation.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. 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. 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.
 - 6. Fluorescent lamps (light bulbs).
- E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, 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.
- F. 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.
- G. Regulatory Requirements: 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.

1.02 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 and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 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.

1.04 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.
 - 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 A

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 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, and Engineer.
- 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. Pre-bid meeting.
 - 2. Pre-construction 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 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Engineer with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. 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 3 EXECUTION

2.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Addenda.
 - 3. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

2.02 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.

2.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- 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.

2.04 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner'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. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- D. Prepare data in the form of an instructional manual.
- E. 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.
- F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Engineer, Consultants, Contractor and subcontractors, with names of responsible parties.
- H. 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.
- I. 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.
- J. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

2.05 WARRANTIES AND BONDS

- 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 Owner'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 and bonds until time specified for submittal.

END OF SECTION

SECTION 01 9113
GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
 - 1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
 - 2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
 - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
 - 4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.
- B. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

1.02 RELATED REQUIREMENTS

- A. Section 01 7000 - Execution and Closeout Requirements: General startup requirements.
- B. Section 01 7800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.
- C. Section 01 7900 - Demonstration and Training: Scope and procedures for Owner personnel training.

1.03 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, unless they require review by Engineer; in that case, submit to Engineer first.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2010 preferred.
 - 5. As soon as possible after submittals made to Engineer are approved, submit copy of approved submittal to the Commissioning Authority.
- B. Product Data: If submittals to Engineer do not include the following, submit copies as soon as possible:
 - 1. Manufacturer's product data, cut sheets, and shop drawings.
 - 2. Manufacturer's installation instructions.
 - 3. Startup, operating, and troubleshooting procedures.
 - 4. Fan and pump curves.
 - 5. Factory test reports.
 - 6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.
- C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.
- D. Startup Plans and Reports.
- E. Completed Prefunctional Checklists.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
 - 1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F (0.3 degree C) and resolution of plus/minus 0.1 degree F (0.05 degree C).
 - 2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
 - 3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.
- D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
 - 1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

- A. Commissioning Authority has prepared the Commissioning Plan.
 - 1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
 - 2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.
- B. Contractor is responsible for compliance with the Commissioning Plan.
- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.
- D. Commissioning Schedule:
 - 1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
 - 2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
 - 3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
 - 4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 STARTUP PLANS AND REPORTS

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.
- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to the Commissioning Authority.

3.03 PREFUNCTIONAL CHECKLISTS

- A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
 - 1. No sampling of identical or near-identical items is allowed.
 - 2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
 - 3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
 - a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
 - b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
 - c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
 - d. Serial number of installed unit.
 - e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer's start-up checklist items and minor testing.
 - f. Sensor and actuator calibration information.
- B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
 - 1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
 - 2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
 - 3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
 - 4. If any Checklist line item is not relevant, record reasons on the form.
 - 5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
 - 6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
 - 7. Submit completed Checklists to Commissioning Authority within two days of completion.
- C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
 - 1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
 - 2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
 - 3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
 - 4. When asked to review the proposed Checklists, do so in a timely manner.
- D. Commissioning Authority Witnessing: Required for:
 - 1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
 - 2. A sampling of non-primary equipment, as allowed by the commissioning plan.
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
 - 1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.04 FUNCTIONAL TESTS

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.
- C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
- D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
 - 1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
 - 2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
 - 3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
 - 4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
 - 5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.
- E. Functional Test Procedures:
 - 1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
 - 2. Examples of Functional Testing:
 - a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods 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).
 - b. 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.
 - c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
 - d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.
- F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.05 SENSOR AND ACTUATOR CALIBRATION

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
- B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements.

Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

- C. All Sensors:
 - 1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
 - 2. Verify that sensors with shielded cable are grounded only at one end.
 - 3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F (0.1 degree C) of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
 - 4. Tolerances for critical applications may be tighter.
- D. Sensors Without Transmitters - Standard Application:
 - 1. Make a reading with a calibrated test instrument within 6 inches (150 mm) of the site sensor.
 - 2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
 - 3. If not, install offset, calibrate or replace sensor.
- E. Sensors With Transmitters - Standard Application.
 - 1. Disconnect sensor.
 - 2. Connect a signal generator in place of sensor.
 - 3. Connect ammeter in series between transmitter and building automation system control panel.
 - 4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
 - 5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
 - 6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
 - 7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
 - 8. Reconnect sensor.
 - 9. Make a reading with a calibrated test instrument within 6 inches (150 mm) of the site sensor.
 - 10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
 - 11. If not, replace sensor and repeat.
 - 12. For pressure sensors, perform a similar process with a suitable signal generator.
- F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
 - 1. Watthour, Voltage, Amperage: 1 percent of design.
 - 2. Pressure, Air, Water, Gas: 3 percent of design.
 - 3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F (0.2 degree C).
 - 4. Relative Humidity: 4 percent of design.
 - 5. Barometric Pressure: 0.1 inch of Hg (340 Pa).
 - 6. Flow Rate, Air: 10 percent of design.
 - 7. Flow Rate, Water: 4 percent of design.
 - 8. AHU Wet Bulb and Dew Point: 2.0 degrees F (1.1 degrees C).
- G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.
- H. Valve/Damper Stroke Setup and Check:
 - 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 - 2. Set pump/fan to normal operating mode.
 - 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 - 4. Command valve/damper to open; verify position is full open and adjust output signal as required.
 - 5. Command valve/damper to a few intermediate positions.
 - 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

- I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
 - 1. With full pressure in the system, command valve closed.
 - 2. Use an ultra-sonic flow meter to detect flow or leakage.

3.06 TEST PROCEDURES - GENERAL

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.
- C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
 - 1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
 - 2. Sampling is not allowed for:
 - a. Major equipment.
 - b. Life-safety-critical equipment.
 - c. Prefunctional Checklist execution.
 - 3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
 - 4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
 - 5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
 - 6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
 - 7. If YY percent of the units in the second sample fail, test all remaining identical units.
 - 8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.
- D. Manual Testing: Use 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").
- E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.
- F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.
- G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.
- H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.
- I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
 - 1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
 - 2. Other points will be monitored by the Commissioning Authority using dataloggers.
 - 3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.

4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
5. Graphical output is desirable and is required for all output if the system can produce it.
6. Monitoring may be used to augment manual testing.

3.07 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01 7800 - Closeout Submittals for additional requirements.
- B. Add design intent documentation furnished by Engineer to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

END OF SECTION

**SECTION 02 8070
ASBESTOS ABATEMENT**

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnish all labor, materials, and equipment to complete asbestos abatement and disposal as shown on the Drawings and/or herein specified.
- B. Project/Air Monitoring will be provided by the Owner.

1.02 REGULATORY REQUIREMENTS

- A. All work to be done under this contract shall be in compliance with Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York (cited as 12 NYCRR Part 56) as amended effective March 21, 2007; U.S. OSHA 29 CFR 1926.1101; and U.S. EPA 40CFR 763 Subpart E, Asbestos Containing Materials in Schools.

1.03 ASBESTOS-CONTAINING MATERIAL

- A. Vermiculite Insulation inside wall chases as identified on the Drawings.
- B. Roofing Materials as identified on the Drawings.

1.04 APPLICABLE VARIANCE

- A. The asbestos abatement contractor is responsible for obtaining any variance needed to complete the project as set forth in Code Rule 12 NYCRR Part 56.

1.05 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.

1.06 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.

1.07 PROTECTION OF UTILITIES

- A. Provide and maintain adequate protection for existing utilities. Repair such Work damaged during construction to the satisfaction of the Engineer.

1.08 CUTTING AND PATCHING

- A. The Contractor is responsible for his own cutting and patching. Refer to Section 01 7000.

1.09 WASTE TRANSPORTATION AND DISPOSAL PROCEDURES

- A. It is the responsibility of the asbestos abatement contractor to determine and comply current waste handling and transportation regulations. Contractor must determine appropriate landfill based on classification of waste and landfill permit authorizations. The asbestos abatement contractor must comply fully with these regulations, all appropriate U.S. Department of Transportation, EPA and Federal, State and local entities' regulations, and all other current legal requirements.

- B. All waste removed from the site must be shipped with a waste manifest. The waste manifest must have at a minimum 1.) Generator name, address, contact and contact number; 2.) Site address, contact name and contact number; 3.) Each transporters name, address, and contact information; 4.) Designated landfill/facility name, address, phone number and EPA/NYSDEC Permit #; 5.) List of waste containers (ie, drums, bags, boxes) and quantity of each container along with a description of waste (i.e. friable pipe insulation, non-friable floor tile, etc.).
- C. All manifests must be in a 5-carbon print. The manifest must be signed by Owner's representative when shipped, signed by transporters, and ultimately signed by the Waste Disposal Facility when received.
- D. A copy of signed manifest must be left with Owner when shipped. A copy signed by Disposal Facility must be returned to Owner within 30 days of the removal of waste from the site.
- E. Any transfer of waste from one waste container to another must only be completed at a transfer station and shall be recorded on manifest.

1.10 SUBMITTALS

- A. Prior to commencement of the work on this project, the Contractor must submit the following to the Engineer:
 - 1. Contractor's NYSDOL License
 - 2. Supervisors NYSDOL Certification that will be responsible for the project
 - 2. Copy of Department of Labor Notification
 - 3. Copy of USEPA Notifications
 - 4. Copy of work plan showing location of work areas, barriers, decontamination unit, waste storage, staging and phasing if applicable.
- B. After completion of the work on this project, the Contractor must submit the following to the Engineer:
 - 1. Contractor's NYSDOL License;
 - 2. Workers and Supervisors NYSDOL Certifications for individuals that supervised were on the work area Entry/Exit Logs;
 - 2. Copy of Department of Labor Notification (required again due to potential amending);
 - 3. Copy of USEPA Notifications (required again due to potential amending);;
 - 4. Copy of final work plan showing location of work areas, barriers, decontamination unit, waste storage, staging and phasing if applicable;
 - 5. Waste manifest completed and signed by disposal facility.

1.11 SPECIAL REQUIREMENTS

- A. The Contractor shall have at least one English-speaking supervisor on the job site at all times while the project is in progress.
- B. Contractor must submit a copy EPA Supervisor Training certificate with training class completed in English.

1.12 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: PERFORM WORK ONLY DURING THE HOURS OF WORK ESTABLISHED AT THE PRE-CONSTRUCTION MEETING OR AS APPROVED IN WRITING BY THE ENGINEER AND DISTRICT AT LEAST 24 HOURS IN ADVANCE OF THE CHANGE.

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.

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.
- 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. Re-secure mounted objects removed from their former positions during area preparation activities.
- E. Relocate objects that were removed to temporary locations back to their original positions.
- F. Repair areas of damage that occurred as a result of abatement activities and as indicated.

END OF DOCUMENT

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete formwork.
- B. Slabs on grade.
- C. Concrete foundation walls.
- D. Concrete reinforcement.

1.2 RELATED REQUIREMENTS

- A. Section 09 6725 - Urethane Resin Flooring

1.3 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.
- E. ACI 305R - Hot Weather Concreting; 2010.
- F. ACI 306R - Cold Weather Concreting; 2010.
- G. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).
- H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2016).
- I. ACI 347R - Guide to Formwork for Concrete; 2014.
- J. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2007b (Reapproved 2014).
- K. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.
- L. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- M. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.
- N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.
- O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.
- P. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
- Q. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.
- R. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- S. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- T. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- U. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars; 2001 (Reapproved 2007).
- V. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).

1.4 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.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
- D. Test Reports: Submit report for each test or series of tests specified.

1.5 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.

PART 2 PRODUCTS

2.1 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. 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: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 - 2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
 - 3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

2.2 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
 - 1. Type: Deformed billet-steel bars.
 - 2. 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. WWR Style: 4 x 8-W6 x W10 (102 x 203-MW39 x MW65).
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.3 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
- 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. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

2.5 ACCESSORY MATERIALS

2.6 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
B. Slab Isolation Joint Filler: 1/2 inch (13 mm) thick, height equal to slab thickness, with removable top section that will form 1/2 inch (13 mm) deep sealant pocket after removal.

2.7 CURING MATERIALS

- A. Moisture-Retaining Sheet: ASTM C171.
1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch (0.102 mm).

2.8 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
C. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch (27.6 MPa).
2. Water-Cement Ratio: Maximum 40 percent by weight.
3. Maximum Slump: 4 inches (100 mm).
4. Maximum Aggregate Size: 5/8 inch (16 mm).

2.9 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.
B. Verify existing slab elevations and coordinate final floor finish elevations with new slab.

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. 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 latex bonding agent only for non-load-bearing applications.
C. 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.
D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches (150 mm). 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. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.
B. 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.

- C. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.4 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.5 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. 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.

3.6 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Coordinate floor finish elevation with existing slab, underlayment and new floor finish. Adjust to provide smooth transition.
- B. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.7 CONCRETE FINISHING

- A. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Exterior exposed surfaces: Steel trowel in accordance with ACI 302.1R. Provide score control joints as indicated. Provide light broom finish.
 - 2. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

3.8 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.

3.9 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. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards (76 cu m) or less of each class of concrete placed.
- D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- E. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.11 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 04 0100
MASONRY MAINTENANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings, schedules, and keynotes, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:
 - 1. Remove and restore exterior masonry where new cap flashings are being installed. The existing cavity wall insulation contains vermiculite asbestos. Brick and insulation removal work shall be performed by licensed abatement personnel as follows:
 - a. The vermiculite lies inside the walls as indicated on Drawings HSR-100 Details 7 & 8 and HSR-101.
 - b. Perform the work inside a two-layer tent for removal of the vermiculite.
 - c. Remove courses of brick as indicated on the above referenced drawing details followed by the removal of all vermiculite inside the cavity from the top of the chase down to one layer of brick below the opening created by the abatement.
 - d. All materials removed as part of this work shall be disposed of as asbestos contaminated.
 - e. Provide blown-in closed cell foam insulation to fill up and enclose the cavity above the opening and up to the roof and also below and on the sides to enclose the bulk vermiculite that remains in the lower portion of the cavity.
 - f. Once the foam has been installed, install the new flashings, including but not limited to copper and fabric mesh as indicated on the Details
 - g. Upon completion of the installation, the entire tent shall be cleaned prior to a final visual inspection by the onsite Project Monitor.
 - h. The work area shall be cleared by collection of a set of aggressive PCM air samples.
 - i. Only after clearance has been achieved, may the tent be removed and the new brick be installed.
 - 2. Prepare and repoint mortar joints.
 - 3. Install clear water repellant on masonry that was repointed, repaired or rebuilt.
 - 4. Remove and reset loose bricks and concrete masonry units under roof edge blocking.
 - 5. Fill hollow core masonry units under roof edge blocking with mortar prior to installing the blocking - the blocking is specified elsewhere.

B. Related Requirements

- | | |
|---------------------------------------|---------------------|
| 1. Carpentry | - Section 06 1000.1 |
| 2. EPDM Roofing | - Section 07 5323 |
| 3. Sheet Metal Flashing & Specialties | - Section 07 6200.1 |
| 4. Roof Accessories | - Section 07 7200 |

1.3 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. The Installer shall have a full time supervisor in the work area 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.
 1. Submit the Supervisor's resume upon request.
2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within fifty miles 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. Submit the reference list upon request.

B. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.

C. Pre-construction conference: Attend the pre-construction meeting and discuss the following:

1. How and when masonry work will be performed.
2. How the masonry work will be coordinated with other work.
3. How roof & building surfaces will be protected, and how the building will be kept watertight as masonry work progresses.
4. Weather to anticipate during construction.
5. The availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
6. A schedule for Manufacturer and Architect inspections.

1.4 SUBMITTALS

A. Submit the following items far enough in advance to obtain approval prior to performing any other work on site:

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 Architect.
4. Samples to show sizes, grade and color, prior to mock-up erection, of each new exposed masonry material. Include the full range of colors and textures needed in the samples.
 - a. Bricks: four samples of solid colors, twelve samples of blended colors.
 - b. Precast concrete: four 6 inch square or round samples to show color and surface finish.
 - c. Mortar: four 6 inch long 1/2 inch wide strips set in metal or plastic channels.
 - d. Anchors: four pieces of each type of anchor.
- 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.
 2. 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.
- C. Payment requisitions will not be processed until all submittals are received and approved.

1.5 JOB MOCK UPS

- A. Prepare mock-ups of masonry work in actual job locations.
 1. For brick rebuilding - provide 4 foot long mockups.
 2. For repointing - provide 2 foot square mockups to show how the joints will be cut, and 2 foot square mockups to show new pointing.
 3. For sealant joints - provide 2 foot long mockups to show how the joints will be prepared, and 2 foot long mockups to show new backer rod and sealant.
- B. Construct each mock up with its associated roof and wall flashings, to show the following:
 1. The color, size and type of each masonry unit and mortar used to set it.
 2. Workmanship quality.
 3. The size and spacing of weep inserts.
 4. Flashings built into the masonry.
 5. Related materials and their installation techniques to fully establish a quality standard for the work.
- C. Mock-ups shall be constructed to establish the minimum acceptable 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 which it was 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 proceed with masonry work until mock-ups are installed, inspected and approved in writing.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Carefully pack, handle, and ship masonry units and accessories 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 types 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 intermixture 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 the roof.
- F. Protect roof surfaces where material and equipment are 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.

1.7 GUARANTEE

- A. 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 five years period beginning upon Final Completion:
 - 1. Defects include but are not limited to the following: leakage, delamination, lifting, loosening, splitting, cracking, joint separation and movement.
 - 2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as guaranteed at his own expense:
 - 3. Guarantee coverage shall include removing and replacing items installed as part of the original work, if removal is needed to make repairs.
- B. Provide one Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple Sections.
- C. The Guarantee shall take effect no more than 30 days before the satisfactory completion of all punch list work.
- 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.

1.8 JOB CONDITIONS

- A. Perform masonry work only when the air temperature is 40 degrees F and above and will remain so until the masonry has dried, but for not less than 72 hours after work ends.
- B. Erect temporary covers over pedestrian walkways and at building entrances and exits which will remain active as the work progresses.
- C. 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.
- D. Protect roof surfaces where material and equipment are 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.

- E. Coordinate masonry removal and restoration with the installation of new flashings.
- F. Prevent masonry work from rapid drying during hot weather. Use burlap to shield fresh masonry from direct sunlight, and mist fresh masonry with potable water so it cures slowly for at least 72 hours.
 - 1. Remove and replace any new masonry that develops shrinkage cracks, or isn't bonded well to adjoining masonry.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

- A. Face Brick: Severe weather (SW) grade face brick and accessories, including special bricks for lintels, arches, corners, and other special conditions, to match the color, surface texture, shape and size of existing bricks.

2.2 MORTAR

- A. General Construction Mortar:
 - 1. Type S, custom colored, non-staining masonry cement containing Type I Portland cement meeting ASTM C150 and Type S hydrated lime meeting ASTM C207.
 - 2. Natural or manufactured sand aggregate selected to match the size, texture, graduation and color of the existing mortar aggregate, meeting ASTM C 144.
 - 3. Clean potable water, free of oils, acids, alkalis and organic matter.
- B. Pointing Mortar:
 - 1. Factory blended Type N masonry cement, aggregate and custom coloring agent, ready to use when mixed with clean potable water, as supplied by Spec-Mix.
- C. Concrete Repair Mortar: Single component, cement mineral based, custom colored repair mortar: Jahn M90, as manufactured by Cathedral Stone Products, Inc.

2.3 MISCELLANEOUS MATERIALS

- A. Anchors: Fabricated from Type 304 stainless steel to match existing.
- B. Reinforcement Bar: minimum #4 epoxy coated steel rebar, with factory formed ridges.
- C. 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.
- D. Backer Rod: Closed cell polyethylene foam, non-absorbent, compressible, chemically inert rod.
- E. Masonry Water Repellent: Cloudy odorless water-based penetrating liquid, UV stable, alkali resistant, translucent floural carbon emulsion, containing no volatile organic compounds: Cathedral Stone Products, Inc. R-97 Water Repellent.
- F. Weep Inserts: Full height head joint inserts formed of a polypropylene honey comb, three-eighths inch thick, Hohmann & Barnard, Inc. #QV Quadro-Vent.

PART 3 - EXECUTION

3.1 GENERAL

- A. Carefully perform work so the structural integrity of masonry adjoining the work is preserved. Simultaneously remove only limited sections of existing masonry; support and protect masonry remaining next to and above the removal areas.
- B. Completely remove and replace any existing masonry that moves, or if cracks form in the mortar joints between the masonry units, or within the masonry units.
- C. Cure all mortar by misting it with potable water to maintain it in a damp condition for not less than 72 hours. Shield fresh mortar from direct sunlight with wet burlap, and prevent fresh mortar from prematurely drying during the curing period. Remove and replace mortar joints that dry pre-maturely.
- D. Cut and remove existing masonry using hand and machine methods. Equip each cutting machine with a separate dedicated vacuum and manufacturer's blade guard vacuum attachment, and control the amount of dust produced so there are no visible plumes. Comply with OSHA crystalline silica standards for construction.
- E. Do not overcut brick head joints and allow the blade to nick the bricks; remove and replace bricks damaged during the cutting and repointing preparation process at no cost to the Owner.

3.2 MORTAR MIXES

- A. Measurement and Mixing:
 - 1. Measure general construction mortar materials when dry by volume using a pail or similar container. Do not measure with a shovel.
 - a. Mix mortar using 1 part mortar cement and 3 parts sand aggregate.
 - b. Thoroughly mix cement and aggregate in a clean mechanical batch mixer before adding water; then continue mixing and add only enough water to produce a workable mix.
 - c. Do not mix mortar by hand.
 - 2. Mix factory blended pointing mortar in a clean mechanical batch mixer, adding only enough water to produce a workable mix.
 - a. Do not mix mortar by hand.
 - 3. Use mortar within 45 minutes of final mixing; do not re-temper or use partially hardened material.
- B. Mix and install mortar with the same ingredients used to produce the approved mock-up. Do not adjust the color or proportions without written approval. Do not use admixtures of any kind in the mortar unless specifically approved.

3.3 BRICK REMOVAL AND REPLACEMENT

- A. Simultaneously remove only limited sections of existing brick masonry; support and protect masonry remaining next to and above the removal areas.
- B. 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 the remaining bricks, to remove all mortar, dust, and loose debris in preparation for rebuilding.

- 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. Install the flashings so a full wythe of new brick will fit flush with the existing wall surface.
- 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.
- H. Do not cut off the backs of the new bricks if a full wythe of brick doesn't fit. Notify the Architect and obtain his direction before proceeding further.

3.4 REPOINTING EXISTING MASONRY

A. Joint Preparation:

- 1. Remove existing mortar and foreign material from the mortar joints to a minimum depth of 1 inch, and deeper where needed to expose sound unweathered mortar.
- 2. Remove mortar from the sides of the joints to provide joints with square backs and to expose the masonry for contact with the pointing mortar. Brush or vacuum the joints to remove dirt and loose debris.
- 3. Remove mortar and other foreign material from the surface of masonry adjacent to the joint.
- 4. Do not spall the edges of adjacent masonry or widen the joints. Replace any masonry which is damaged.

B. Joint Pointing:

- 1. Rinse the joint surfaces with water to remove dust and mortar particles just prior to repointing. Time the rinse, so when repointing occurs, excess water has evaporated and the existing masonry is damp but free of standing water.
- 2. Apply pointing mortar in 1/2 inch thick layers, and thoroughly compact each layer before adding the next layer, to completely fill each joint.
- 3. Slightly recess pointing mortar from the face of the adjacent masonry units. Do not spread mortar on the edges or faces of the masonry. Do not featheredge the mortar.
- 4. Tool repointed joints when the mortar is thumbprint hard. Remove excess mortar from the edges of the joints with a soft bristle brush.

C. Cleaning:

- 1. Immediately after the mortar has fully hardened, thoroughly clean masonry surfaces of excess mortar and foreign matter using stiff nylon or bristle brushes and clean water.

2. Do not use metal scrapers or brushes. Do not use acid or alkali cleaning agents. Do not pressure-wash the masonry or new pointing mortar.

3.5 SEALANT JOINTS

- A. Carefully remove existing sealant and back up material from within the joints to a minimum depth of 1-1/2 inches, and from the surface of adjoining masonry at the edges of the joints.
 1. Use hand tools and work to avoid damage to adjoining masonry.
 2. Replace adjoining masonry damaged during sealant removal work.
- B. Install new backer rod without puncturing or tearing it, to snugly fill the joint at a depth to yield a sealant joint twice as wide as it is deep.
 1. Do not twist backer rods, or install multiple pieces of undersized rod, when the correct size rod is not onsite.
- C. Mask the edges of all joints prior to installing sealant.
 1. Push sealant into the joint to completely fill it, tool the sealant to produce a slightly concave, neat recessed joint, and remove joint masking before excess sealant sets.

3.6 WATER REPELLENT

- A. Prepare and clean masonry surfaces to receive water repellent utilizing hand, chemical and pressure water methods as needed to remove all dirt, dust, efflorescence, mold, salt, grease, oil, asphalt, laitance, paint and other foreign materials.
- B. Allow the masonry surfaces to dry for a minimum of 48 hours at a temperature above 50° F.
- C. Mask and protect adjoining surfaces i.e., the roof, flashings, windows, side walls and site plantings from over spray.
- D. Apply two coats of water repellent using a 1 inch nap roller to saturate the masonry, starting at the bottom so the material runs 6 to 8 inches below the points of application.
 1. Apply the second coat of water repellent about 10 minutes after the first coat, and as soon as the first coat has soaked into the masonry, but before the first coat dries.

3.7 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 pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks and damage that weren't 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 are neat, orderly and workmanlike. 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.

END OF SECTION

**SECTION 04 2000
UNIT MASONRY**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete block.
- B. Clay facing brick.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Flashings.
- F. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Reinforcing steel for grouted masonry.

1.3 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2011.
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.
- F. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.
- G. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2014.
- H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- I. ASTM C476 - Standard Specification for Grout for Masonry; 2010.
- J. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2016.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- L. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2005.
- M. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2005.

1.4 SUBMITTALS

- A. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- B. Samples: Submit four samples of decorative block and facing brick units to illustrate color, texture, and extremes of color range.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three 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.

1.6 MOCK-UPS

- A. Construct a masonry wall as a mock-up panel sized 8 feet (2.4 m) long by 6 feet (1.8 m) high; include mortar, accessories, reinforcement, and flashings (with lap joint, corner, and end dam) in mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depth of 8 inches (200 mm).
 - 2. Special Shapes: Provide non-standard blocks configured for corners.
 - a. Provide bullnose units for outside corners.
 - 3. Load-Bearing Units: ASTM C90, normal weight.
 - a. Hollow block.
 - b. Exterior Exposed Faces: Manufacturer's standard color and texture where indicated.
 - c. Texture: Split Face.
 - 4. Non-Loadbearing Units: ASTM C129.
 - a. Hollow block, as indicated.
 - b. Normal weight.

2.2 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
 - 1. Color and texture: Match Existing.
 - 2. Nominal size: Match Existing.
 - 3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect or existing units can be reused.

2.3 MORTAR AND GROUT MATERIALS

- A. Water: Clean and potable.
- B. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Type: Type N.
 - 2. Color: Mineral pigments added as required to produce approved color sample. Match Existing

2.4 REINFORCEMENT AND ANCHORAGE

- A. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.
 - 3. Size: 0.1875 inch (4.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.
- B. Strap Anchors: Bent steel shapes, 1-1/2 inch (38 mm) width, 0.105 inch (2.7 mm) thick, 24 inch (610 mm) length, with 1-1/2 inch (38 mm) long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M, Class B.

- C. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face.

2.5 FLASHINGS

- A. Membrane Non-Asphaltic Flashing Materials:
 - 1. Composite Polymer Flashings - Self-Adhering: Composite polyethylene; 40 mil (1mm) thick with pressure-sensitive adhesive and release paper.
 - a. Manufacturers:
 - a) Hohmann & Barnard, Inc; Textroflash: www.h-b.com/#sle.

2.6 ACCESSORIES

- A. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
- B. Weeps:
 - 1. Type: Extruded propylene with honeycomb design.
 - 2. Color(s): As selected by Engineer from manufacturer's full range.
- C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
 - 1. ProSoCo, Inc. ;Sure Klean Vana Trol or approved equal.

2.7 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Exterior, loadbearing masonry: Type N.
 - 2. Interior, loadbearing masonry: Type N.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Engineer's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. 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. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.
- C. If temperatures could not be maintained within specified ranges contractor to submit alternate work plan for approval.

3.4 COURSING

- A. Match existing coursing where installing in existing construction.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Running. Match existing decorative header course and inserts.
 - 2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave.

3.5 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Interlock intersections and external corners.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.6 WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at 16 inches (406 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.7 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHER MASONRY, and CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.
- C. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch (16 mm) mortar cover on each side.
- D. Lap joint reinforcement ends minimum 6 inches (150 mm).
- E. 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 36 inches (900 mm) horizontally and 24 inches (600 mm) vertically.
- F. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches (38 mm) with at least 5/8 inch (16 mm) mortar cover to the outside face of the anchor.

3.8 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 (152 mm), minimum, into adjacent masonry or turn up flashing ends at least 1 inch (25.4 mm), minimum, to form watertight pan at non-masonry construction.
- B. Terminate flashing up 8 inches (203 mm) minimum on vertical surface of backing:
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- D. Lap end joints of flashings at least 6 inches (152 mm), minimum, and seal watertight with flashing sealant/adhesive.

3.9 LINTELS

- A. Install loose steel lintels over openings.

3.10 GROUTED COMPONENTS

- A. Reinforce bond beams with 2, No. 4 (M____) bars, 1 inch (25 mm) from bottom web.
- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.
- E. At bearing locations, fill masonry cores with grout for a minimum 12 inches (300 mm) either side of opening.

3.11 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Do not build into masonry construction organic materials that are subject to deterioration.

3.12 TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch (6 mm).
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.
- D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.

3.13 CUTTING AND FITTING

- A. Cut and fit for pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.

3.14 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.

3.15 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Structural steel framing members.
- B. Structural steel support members.
- C. Grouting under base plates.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; 2011.
- B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.
- 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; 2015.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
- 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 A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).
- 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.
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (Errata 2016).

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, attachments, and fasteners.
 - 2. Connections.
 - 3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- 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.

1.5 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 5 years of documented experience.
- 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.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Angles and Plates: ASTM A36/A36M.
- B. Steel W Shapes and Tees: ASTM A992/A992M.
- C. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.
- D. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M, Class C.
- E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- F. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch (13.7 MPa).
 - 2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch (48 MPa).
- G. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

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.

2.3 FINISH

- A. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft 530 g/sq m) galvanized coating.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.2 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 indicated on shop drawings.
- D. After erection, prime welds, abrasions, and surfaces not galvanized, except surfaces to be in contact with concrete.
- E. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.3 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

3.4 FIELD QUALITY CONTROL

- A. The Owner may engage an independent testing agency to perform field quality control tests, as specified in Section 01 4000 - Quality Requirements. Cooperate with testing lab to provide access and information required.

END OF SECTION

**SECTION 06 1000
ROUGH CARPENTRY**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Non-structural dimension lumber framing.
- C. Sheathing and roof deck.
- D. Roofing nailers.
- E. Concealed wood blocking, nailers, and supports.

1.2 RELATED REQUIREMENTS

- A. Section 04 2000 - Unit Masonry: Setting anchors in masonry construction.
- B. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

1.3 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- B. NELMA (SGR) - Standard Grading Rules for Northeastern Lumber; 2013.
- C. PS 1 - Structural Plywood; 2009.
- D. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- E. PS 20 - American Softwood Lumber Standard; 2010.
- F. WWP A G-5 - Western Lumber Grading Rules; 2011.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on materials.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

2.2 DIMENSION LUMBER

- A. Grading Agency: Northeastern Lumber Manufacturers Association; NELMA (SGR).
- B. Grading Agency: Western Wood Products Association; WWP A G-5.
- C. Sizes: Nominal sizes as indicated on drawings, S4S.
- D. Moisture Content: S-dry or MC19.
- E. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm)):
 - 1. Species: Any allowed under referenced grading rules.
 - 2. Grade: No. 2.
- F. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16 (50 by 150 mm through 100 by 400 mm)):

1. Machine stress-rated (MSR) as follows:
 - a. E (minimum modulus of elasticity): 1,300,000 psi (8960 MPa).
 2. Species: Any allowed under grading rules.
 3. Grade: No. 1 & Btr.
- G. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
1. Lumber: S4S, No. 2 or Standard Grade.
 2. Boards: Standard or No. 3.

2.3 CONSTRUCTION PANELS

- A. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
1. Bond Classification: Exterior.
 2. Span Rating: 60.
 3. Performance Category: 3/4 PERF CAT.
- B. Wall Sheathing: Any PS 2 type.
1. Bond Classification: Exterior.
 2. Grade: Structural I Sheathing.
 3. Span Rating: 24.
 4. Performance Category: 1/2 PERF CAT.
 5. Edge Profile: Square edge.

2.4 ACCESSORIES

- A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for all applications.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
- D. Water-Resistive Barrier: As specified in Section 07 2500.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate installation of rough carpentry members and anchors specified in other sections.

3.2 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.3 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA (WFCM) Wood Frame Construction Manual.
- E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches (38 mm) of bearing at each end.

- F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

3.4 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.5 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.6 INSTALLATION OF CONSTRUCTION PANELS

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. Nail panels to framing; staples are not permitted.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails or screws.
 - 1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

3.7 TOLERANCES

- A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.8 CLEANING

- A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 1000.1
CARPENTRY - ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings, schedules and notes, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Roof related wood nailers, blocking, shims and plywood.
2. Light gauge metal framing and gypsum board.
3. Re-secure existing roof related blocking; remove and separate multiple layers of blocking, and secure each layer individually.

B. Related Requirements

- | | |
|---------------------------------------|----------------------|
| 1. Masonry Maintenance | - Section 04 0100 |
| 2. EPDM Roofing | - Section 07 5323 |
| 3. Sheet Metal Flashing & Specialties | - Section 07 6200 .1 |
| 4. Roof Accessories | - Section 07 7200 |

1.3 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. 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.
 1. Submit the supervisor's resume upon request.
2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within fifty miles 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. Submit the reference list upon request.

- B. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.

- C. Pre-Construction Conference: Attend the pre-construction meeting and 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.

1.4 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 on site.
 - 2. Manufacturer's technical literature for all materials.
 - 3. Test reports and certifications substantiating compliance with specification requirements if requested by the Architect.
 - 4. 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 and fit on adjoining work.
- 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.
- D. Payment requisitions will not be processed until all submittals are received and approved.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials dry at all times. Cover with tarps and protect against exposure to weather and contact with damp or wet surfaces.
- B. Do not overload the structure when storing material on the roof.
- C. Protect roof surfaces where material and equipment are 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.
- D. Do not overload the structure when storing materials on the roof.

1.6 GUARANTEE

- 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 five years beginning upon Final Completion:
 - 1. Defects include but are not limited to the following: leakage, delamination, lifting, loosening, splitting, cracking, joint separation and movement.
 - 2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as guaranteed at his own expense:

3. Guarantee coverage shall include removing and replacing items installed as part of the original work, if removal is needed to make repairs.
- B. Provide one Guarantee that covers “all work performed” when a single contractor is awarded work specified in multiple Sections.
- C. The Guarantee shall take effect no more than 30 days before the satisfactory completion of all punch list work.
- 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.

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. Structural framing: # 2 or better Douglas Fir dimension lumber, free of large knots and other imperfections.
 4. 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. METAL, including light gauge metal channel and stud sections factory formed of minimum 24 gauge cold rolled galvanized steel.
- C. GYPSUM BOARD & ACCESSORIES, 1/2 inch thick Type X Fire Resistant gypsum board, galvanized steel bead accessories, tape and compound.

2.2 FASTENERS

- A. Hot dipped galvanized steel, stainless steel, or steel covered with a proprietary rust inhibiting coating.
 1. Do not use un-coated steel nails. Remove and replace carpentry components installed with un-coated steel nails.
- B. Use screws wherever possible, minimum size diameter #12. If nails are used they shall be annular ring shank type.
 1. Do not use dry wall screws to secure wood blocking assemblies. Remove and replace carpentry components installed with drywall screws.

2.3 CARPENTRY ACCESSORIES

- A. Fiberglass batt insulation: un-faced fiberglass insulation, minimum thickness 6 inches, and as needed to fill the expansion joints.
- B. Rockwool batt insulation: un-faced blown fiber insulation, minimum thickness 6 inches, and as needed to fill the expansion joints.

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 shapes needed and adjust wood blocking to suit the existing conditions and achieve 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 force of 275 pounds per lineal foot in any direction. Countersink all fasteners flush unless otherwise shown.
- E. Space fasteners to achieve adequate holding power, and generally 12 inches apart.
 - 1. Space nails in wood blocking 8 inches apart.
 - 2. Install two rows of fasteners on blocking wider than 5 inches.
- F. 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.
- G. Fasten wood blocking to underlying steel members at gypsum and structural wood fiber deck areas, with self tapping screws. Pre-drill holes in the steel members or utilize self drilling/tapping screws.
- H. Fasten wood and metal blocking assemblies to metal decks with #12 screws.
- I. Fasten wood and metal blocking assemblies to concrete decks and masonry walls with 1/4 inch diameter Spike or Drive fasteners. Pre-drill the holes.

3.2 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 pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks and damage that weren't 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 are neat, orderly and workmanlike. 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.

END OF SECTION

**SECTION 07 1900
WATER REPELLENTS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water repellents applied to exterior, masonry surfaces.

1.2 REFERENCE STANDARDS

- A. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.
- B. ASTM D5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes, and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2013).

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience

1.5 FIELD CONDITIONS

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F (10 degrees C) or higher than 100 degrees F (38 degrees C).

PART 2 PRODUCTS

2.1 MATERIALS

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
 - 1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
 - 2. Number of Coats: Two.
 - 3. VOC Content: Less than 600 g/L, when tested in accordance with ASTM D3960 or ASTM D5095.
 - 4. Moisture Absorption When Applied to Masonry: Five percent, maximum, when tested in accordance with ASTM C140/C140M using masonry sample completely coated with water repellent.
 - 5. Maintains dry appearance when wetted.
 - 6. Silane, siloxane, silane-siloxane blend, or siliconate that reacts chemically with concrete and masonry.
 - 7. Water-based siloxane, silane, or blend that reacts chemically with concrete and masonry.
 - a. Manufacturers:
 - a) PROSOCO, Inc; Sure Klean Weather Seal H40: www.prosoco.com/#sle.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.

- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.2 PREPARATION

- A. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- B. Remove loose particles and foreign matter.
- C. Scrub and rinse surfaces with water and let dry.
- D. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.3 APPLICATION

- A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply at rate recommended by manufacturer, continuously over entire surface.
- C. Apply two coats, minimum.
- D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION

SECTION 07 2119
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Foamed-in-place insulation.
 - 1. In masonry cavity walls were noted.

1.2 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- B. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics; 2010.
- C. ASTM D1623 - Standard Test Method for Tensile And Tensile Adhesion Properties of Rigid Cellular Plastics; 2009.
- D. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- G. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, insulation properties, and preparation requirements.

1.4 FIELD CONDITIONS

- A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
 - 1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and fire protection requirements.
 - 2. Thermal Resistance: R-value (RSI-value) of 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature when tested in accordance with ASTM C518.
 - 3. Water Vapor Permeance: Vapor retarder; 2 perms (115 ng/(Pa s sq m)), maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
 - 4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
 - 5. Air Permeance: 0.04 cfm per square foot (0.2 L/(s/sq m)), maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf (75 Pa).
 - 6. Closed Cell Content: At least 90 percent.
 - 7. Surface Burning Characteristics: Flame spread/Smoke developed index of 75/450, maximum, when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Coordinate application with hazardous material abatement specifications and requirements.

3.2 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

3.3 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.

3.4 PROTECTION

- A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 2700
AIR BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Air barriers under exterior cladding.

1.2 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Sheating.

1.3 DEFINITIONS

- A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.4 REFERENCE STANDARDS

- A. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2014.
- B. ASTM D751 - Standard Test Methods for Coated Fabrics; 2006 (Reapproved 2011).
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- E. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.
- F. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; ICC Evaluation Service, Inc; 2011.
- G. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

1.6 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Evaluated Air Barrier Assemblies; www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.
- B. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.7 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.1 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

- A. Air Barrier Sheet, Mechanically Fastened:
 - 1. Air Permeance: 0.004 cfm/sq ft (0.02 L/(s sq m)), maximum, when tested in accordance with ASTM E2178.
 - 2. Water Vapor Permeance: 10 perms (574 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F (23 degrees C).
 - 3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 90 days of weather exposure.

4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, Class A, when tested in accordance with ASTM E84.
5. Seam and Perimeter Tape: Polyethylene self-adhering type, 2-1/2 inches (64 mm) wide, compatible with sheet material; unless otherwise indicated.
6. Products:
 - a. DuPont de Nemours, Inc; Tyvek CommercialWrap D with Tyvek Tape: building.dupont.com/#sle.
 - b. Henry Company; WeatherSmart Commercial: www.henry.com/#sle.

2.2 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
- B. Flexible Flashing: Self-adhering or mechanically-attached flashing used for wall penetrations in accordance with ICC-ES AC148 requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready for work of this section.
- B. Where existing conditions are responsibility of another installer, notify Engineer of unsatisfactory conditions.
- C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.3 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Mechanically Fastened Sheets - On Exterior:
 1. Install sheets shingle fashion to shed water, with seams generally horizontal.
 2. Overlap seams as recommended by manufacturer, 6 inches (152 mm), minimum.
 3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches (305 mm), minimum.
 4. Attach to framed construction with fasteners extending through sheathing into framing, and space fasteners at 12 to 18 inches (305 to 460 mm) on center along each framing member supporting sheathing.
 5. Seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
 6. Install air barrier underneath jamb flashings.
 7. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.
- E. Openings and Penetrations in Exterior Air Barriers:
 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto air barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.

2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
4. At head of openings, install flashing under air barrier extending at least 2 inches (50 mm) beyond face of jambs; seal air barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Do not cover installed air barriers until required inspections have been completed.

3.5 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

**SECTION 07 3113
ASPHALT SHINGLES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Asphalt shingle roofing.
- B. Flexible sheet membranes for eave protection and underlayment.
- C. Metal flashing.

1.2 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Roof sheathing.
- B. Section 07 7123 - Manufactured Gutters and Downspouts.

1.3 REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2015a.
- B. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2020.
- C. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules; 2019.
- D. ASTM D7158/D7158M - Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method); 2017.
- E. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2011.
- F. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2013.
- G. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments; 2012.
- H. NRCA (RM) - The NRCA Roofing Manual; 2017.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.
- C. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Warwick Valley Central School District's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Warwick Valley Central School District's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.
 - 2. Extra Shingles: 33 sq ft (3 sq m) of each type and color.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of roofing systems similar to those required for this project, with not less than 5 years of documented experience.
- B. Installer Qualifications: Company specializing in installing asphalt shingles, with at least 3 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store materials with labels intact in manufacturer's unopened packaging until ready for installation.
- B. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

- C. Protect materials from harmful environmental elements, construction dust, direct sunlight, and other potentially detrimental conditions.
- D. When storing roofing materials on roofing system ensure that no damage occurs to supporting members and other materials.

1.7 FIELD CONDITIONS

- A. Do not install shingles, eave protection membrane or underlayment when surface or ambient air temperatures are below 45 degrees F (7 degrees C).

1.8 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide 25 year manufacturer's warranty for coverage against black streaks caused by algae.
- C. Provide 10-year manufacturer's warranty for material defects.
- D. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Asphalt Shingles:
 - 1. GAF; Timberline UHD Shingles: www.gaf.com/#sle.
- B. Algae Resistant Asphalt Shingles:

2.2 ASPHALT SHINGLES

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
 - 1. Fire Resistance: Class A, complying with ASTM E108.
 - 2. Wind Resistance: Class A, when tested in accordance with ASTM D3161/D3161M.
 - 3. Wind Resistance (Uplift): Class H, when tested in accordance with ASTM D7158/D7158M.
 - 4. Algae resistant.
 - 5. Self-sealing type.
 - 6. Style: Laminated overlay.
 - 7. Color: As selected by Architect.

2.3 SHEET MATERIALS

- A. Eave Protection Membrane:
 - 1. Eave Protection Membrane: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil (1 mm) total thickness; with strippable treated release paper and polyethylene sheet top surface.
- B. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
 - 1. Type: Woven polypropylene with anti-slip polyolefin coating on both sides.
 - 2. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.
 - 3. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
 - 4. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
 - 5. Fasteners: As recommended by manufacturer or building code qualification report or approval.

2.4 METAL FLASHING

- A. Metal Flashings: Provide sheet metal eave edge and gable edge.
 - 1. Form flashings to profiles indicated on drawings.

2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
 3. Hem exposed edges of flashings minimum 1/4 inch (6 mm) on underside.
- B. Aluminum Flashing: Prefinished aluminum, 26 gauge, 0.017 inch (0.43 mm) minimum thickness; PVC coating, color as selected.

2.5 ACCESSORIES

- A. Roofing Nails: Ring shank round wire shingle type, galvanized steel, minimum 3/8-inch (9.5 mm) head diameter, 12-gauge, 0.109-inch (2.77 mm) nail shank diameter, 1-1/2 inches (38 mm) long and complying with ASTM F1667.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions prior to starting this work.
- B. Verify that roof deck is of sufficient thickness to accept fasteners.
- C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.
- D. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.2 PREPARATION

- A. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.
- B. Broom clean deck surfaces before installing underlayment or eave protection.
- C. Protect surrounding areas and adjacent surfaces from damage during execution of this work.
- D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches (50 mm) and seal with roof cement, and secure flange with nails spaced 12 inches (300 mm) on center.

3.3 INSTALLATION

- A. Eave Protection Membrane:
1. Install eave protection membrane from eave edge to minimum 48 inches (1,220 mm) up-slope beyond interior face of exterior wall.
 2. Install eave protection membrane in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Underlayment:
1. Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches (100 mm); stagger end laps of each consecutive layer, nail in place, and weather lap minimum 4 inches (100 mm) over eave protection.
 2. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.
- C. Shingles:
1. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
 - a. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
 - b. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.
 2. Place shingles in straight coursing pattern with 5-inch (125 mm) weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.
 3. Project first course of shingles 3/4 inch (19 mm) beyond fascia boards.
 4. Extend shingles 1/2 inch (13 mm) beyond face of gable edge fascia boards.

5. Complete installation to provide weathertight service.

3.4 CLEANING

- A. See Section 01 7000 - Execution for additional requirements.
- B. Clean exposed work upon completion of installation; remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to finish.

3.5 PROTECTION

- A. Do not permit traffic over finished roof surface; protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged asphalt shingles or accessories before Date of Substantial Completion.

END OF SECTION

**SECTION 07 4646
FIBER-CEMENT SIDING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fiber-cement siding.
- B. Fiber-cement soffit panels
- C. Fiber-cement trim

1.2 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Siding substrate.
- B. Section 09 9000 - Painting and Coatings: Field painting.

1.3 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- B. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2012).
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's requirements for related materials to be installed by others.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods, including nail patterns.
- C. Manufacturer's qualification statement.
- D. Installer's qualification statement.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified in this section with not less than three years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.
- B. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

1.7 FIELD CONDITIONS

- A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

1.8 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty for years as indicated under Fiber-Cement Siding article sub-headings for "Warranty". Complete forms in Warwick Valley Central School District's name and register with manufacturer.

PART 2 PRODUCTS

2.1 FIBER-CEMENT SIDING

- A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Style: Standard lap style.
 - 2. Texture: Smooth.
 - 3. Length: 12 feet (3.7 m), nominal.
 - 4. Width (Height): 5-1/4 inches (133 mm).
 - 5. Thickness: 5/16 inch (8 mm), nominal.
 - 6. Finish: Factory applied primer.
 - 7. Warranty: 30 year limited; nontransferable.
 - 8. Products:
 - a. James Hardie Building Products, Inc; HardiePlank: www.jameshardie.com/#sle.
- B. Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Texture: Smooth.
 - 2. Length: 96 inches (2440 mm), nominal.
 - 3. Width: 48 inches (1220 mm).
 - 4. Thickness: 5/16 inch (7.9 mm), nominal.
 - 5. Finish: Factory applied primer.
 - 6. Manufacturer: Same as siding.
- C. Trim Boards: Boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Texture: Smooth.
 - 2. Length: 144 inches (3657 mm), nominal.
 - 3. Width: As indicated or required to conform to detailed profiles.
 - 4. Thickness: 0.75 inch (19 mm), nominal.
 - 5. Finish: Factory applied primer.
 - 6. Manufacturer: Same as siding.

2.2 ACCESSORIES

- A. Fasteners: Galvanized or corrosion resistant; length as required to penetrate, 1-1/4 inches (31.8 mm), minimum.
- B. Exterior Soffit Vents: One piece, perforated, ASTM A653/A653M galvanized steel with G90 coating, with edge suitable for direct application to gypsum board and manufactured especially for soffit application, and provide continuous vent.
- C. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.
- D. Finish Paint: Latex house paint acceptable to siding manufacturer; primer recommended by paint manufacturer.
- E. Finish Paint: See section 09 9000 for requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Do not begin until unacceptable conditions have been corrected.
- C. If substrate preparation is responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations.
 - 1. Read warranty and comply with terms necessary to maintain warranty coverage.
 - 2. Use trim details as indicated on drawings.
 - 3. Touch up field cut edges before installing.
 - 4. Pre-drill nail holes if necessary to prevent breakage.
- B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.
- C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.
- D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- E. Exterior Soffit Vents: Install in accordance with manufacturer's written instructions and at locations indicated on drawings; provide vent area as indicated on drawings.
- F. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.
- G. Finish Painting: Within one week after installation, paint siding and trim with one coat primer and two coats finish paint. See section 09 9000 for requirements.

3.3 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

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. Portions of the existing roof is under warranty. Coordinate with Owner's representative for further information.
 - 1. Contractor must notify and be authorized by the manufacturer to perform all work as per the manufacturer's instruction.
 - 2. Refer to paragraph 1.12
- B. Modification to existing EPDM membrane roofing system.
- C. Modification to existing bituminous membrane roofing.
- D. Remove all existing membrane, insulation, flashings, curbs, cover boards, and vapor barrier as required to provide and install new openings, mechanical equipment, connection to existing roofing, curbs, and dunnage as shown on drawings.
- E. Cut new openings and install curbs.
- F. Disposal of removal and construction waste is the responsibility of General Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.
- G. Install new isocyanurate insulation, cover board, and flashings on all roof areas indicated or required.
- H. 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.
- I. Roof top mechanical equipment work is specified else-where. Coordinate with the mechanical contractors to set new curbs and equipment, and make modifications to the existing curbs and equipment; then install new roof flashings as indicated.
- J. Maintain building watertight at all times.
- K. 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.
- L. Comply with the published recommendations and instructions of the roofing membrane manufacturer.
- M. Commencement of work by Contractor 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.

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. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

- B. ASTM 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; 2016.
- D. ASTM D3909/D3909M - Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules; 2014.
- E. ASTM D2626/D2626M - Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing; 2004 (Reapproved 2012).
- F. ASTM D1079 - Standard Terminology Relating to Roofing and Waterproofing; 2013.
- G. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2013.
- H. ASTM D6380/D6380M - Standard Specification for Asphalt Roll Roofing (Organic Felt); 2003 (Reapproved 2013).
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- J. FM 4470 - Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction; 2012.
- K. NRCA (RM) - The NRCA Roofing Manual; 2017.
- L. PS 1 - Structural Plywood; 2009.
- M. PS 20 - American Softwood Lumber Standard; 2010.

1.6 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Before start of roofing work, General Construction Contractor shall hold a meeting to discuss the proper installation of materials, status of the existing warranty and requirements to maintain the existing warranty and requirements to maintain the existing warranty.
 - 1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
 - 2. Notify Owner's Representative well in advance of meeting.

1.7 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. 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 each roof membrane and fabric type.
 - 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.
 - 2. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.
 - 3. Pre-Work Site and Building Inspection Report with photos to documents conditions before commencing work.
 - 4. Written certification from the manufacturer which states that the installer is acceptable or licensed to install the specified roofing; if not previously provided.

- C. 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.

1.9 QUALITY ASSURANCE

- A. Portions of Existing Roof is under warranty.
 - 1. Contractor must notify and be authorized by the manufacturer to perform all work as per the manufacturer's instruction.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty (20) years of documented experience.
- C. Installer Qualifications: Roofing installer shall have the following:
 - 1. A firm (Installer) with not less than 5 continuous years experience performing EPDM and Built-up roofing work similar to that required for this project, employing personnel skilled in the specified work.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. 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.
 - c. 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.
- D. Material Quality: Obtain each product, including the insulation, cover board, PVC 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 5 continuous years.
- E. Pre-Work Conference: Meet at the project site approximately one week prior to starting roof work, with the Owner's Representative and Architect and other representatives concerned about the work, to discuss the following:
 - 1. How the building will be kept watertight as old 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 and Owner's Representative inspections.

1.10 JOB CONDITIONS (CAUTIONS & WARNINGS)

- A. 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.

- B. Remove empty adhesive and solvent containers and contaminated rags from the roof and legally dispose of them daily.
- C. 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. Immediately remove any insulation which gets wet from the job site.
- D. Do not overload the structure when storing materials on the roof.
- E. 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. Portions of 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. Guarantee/Warranty coverage shall remain in effect for gust wind speeds up to 72 miles per hour, measured at ground level at the site.
 - b. 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. 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 Contractors warranty.
 - 4. Manufacturer's and Contractor's Guarantees/Warranties shall be issued no more than 30 days before the satisfactory completion of punch list work.
- C. Existing Roofing System Not Under Warranty
 - 1. Provide a Contractor's written Guarantee which warrants that all work performed under this contract will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:
 - a. Defective work includes but is not limited to the following types of failure: leakage, delamination, lifting, loosening, splitting, cracking, and undue expansion.
 - b. The Contractor's Guarantee shall provide that the Contractor will make the repairs needed to enable the work to perform as warranted at his own expense:
 - c. 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. 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 manufactured by others, for non-warranted roof areas are acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
 - a. Specializing in manufacturing the roofing system to be provided.
 - b. Minimum ten years of experience manufacturing the roofing system to be provided.
- 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.

1. 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/100°F/50% strain
6. Heat Aging	ASTM D-573	1200 psi min@ 200% elongation/4 wks/240°F
7. Brittleness Temperature	ASTM D-746	-49°F
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 splice 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 with inorganic glass mat facers and a water resistant core, formulated in 48 x 48 inch 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, Class I, Grade 2.
 - 1. Tapered insulation sloping 1/4 inch per foot, minimum starting thickness as shown on the roof plan.
 - 2. Crickets sloping 1/4 inch per foot.
 - 3. At repairs to existing building match thickness of existing insulation.
 - 4. Product: Firestone “ISO 95+ Isocyanurate Insulation” or approved equal.

2.4 BITUMINOUS MEMBRANE ROOFING

- A. Match existing.
- B. Base Sheet: ASTM D4601/D4601M Type I; asphalt-coated glass fiber; unperforated.
- C. Mineral Surface Cap Sheet: Asphalt-saturated organic roll roofing, ASTM D6380/D6380M, Class M, Type II, 2 inch (50 mm) selvage; white colored mineral granules.
- D. Roof Cement: ASTM D4586/D4586M, Type I, asbestos free.

2.5 ACCESSORY MATERIALS

- A. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
 - 2. Minimum Base Metal Thickness: As indicated.
 - 3. Nominal Height: As indicated.
 - 4. Side Joints: Lapped, mechanically fastened.
 - 5. End Joints: Lapped, mechanically fastened.
- B. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
 - 1. Thickness: Same as thickness of roof insulation.
- C. Concrete Pavers: Interlocking, with shiplap edges on all sides and integral radiused bearing pads.
 - 1. Size: Approximately 30 inches (750 mm) by 30 inches (750 mm) by 1-1/2 inches (38 mm) 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 PREPARATION

- A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.
- B. 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.
- C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.
- D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

3.5 INSULATION AND COVER BOARD INSTALLATION

- A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.
- B. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).
- C. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by membrane manufacturer.

3.6 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 PVC 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 EPDM 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 (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.

3.7 BITUMINOUS MEMBRANE APPLICATION

- A. Install built-up bituminous roofing system in accordance with manufacturers recommendations and NRCA (RM) applicable requirements.
- B. Lay base sheet, coated side down. Lap sides 2 inches (50 mm); lap ends 6 inches (150 mm).
 1. Set in cold mastic at 2 gal/sq ft (97 L/sq m).
- C. Apply cap sheet membrane plies, weather lap edges and ends, and mop with 20 lbs/square (100 sq ft) (9 kgs/square (9.3 sq m)) of bitumen per ply.
- D. Apply smooth, free from air pockets, wrinkles, fish-mouths, or tears.
- E. At intersections with vertical surfaces:
 1. Extend membrane and base sheet over cant strips and up a minimum of 4 inches (100 mm) onto vertical surfaces.
 2. Mop on base flashing of two additional plies of felt and one ply of base flashing material.
- F. Around roof penetrations, mop in and seal flanges and flashings with two additional plies of felt.
- G. Install walkway pads in cold mastic at 2 gal/sq ft (97 L/sq m). Set joints 6 inches (150 mm) apart.

3.8 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. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
 1. Follow roofing manufacturer's instructions.
 2. Remove protective plastic surface film immediately before installation.
 3. Install water block sealant under the membrane anchorage leg.
 4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
 5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
- C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, 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.
- D. 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.

3.9 FINISHING AND WALKWAY 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 where indicated and detailed.
- B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch (25 mm) and maximum of 3.0 inches (75 mm) from each other to allow for drainage.
 1. If installation of walkway pads over field fabricated splices or within 6 inches (150 mm) 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 (150 mm) 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.

3.10 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.

3.11 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.

3.12 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 5323
EPDM ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings, schedules, and keynotes, as specified, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:
 - 1. Inspect the underside of the roof decks before starting work, and periodically each day as work occurs, to determine if there are conduits, pipes, ceiling hangers or fixtures next to the deck or fastened to the deck that could be affected as roof work occurs.
 - a. Perform roof work so any conduits, pipes, ceiling hangers or fixtures are not disturbed.
 - b. Replace and reset any conduits, pipes, ceiling hangers or fixtures that are affected by the work.
 - 2. Remove and dispose of existing foam roofing, gravel surfacing, bituminous roofing, insulation, the vapor barrier, underlayment, wood blocking, and flashing.
 - a. Clean all residual material from the surface of the decks, and from within the flutes of the steel decks.
 - b. The work may include removing asbestos containing roofing materials. Refer to the asbestos abatement specification for additional information and asbestos removal requirements.
 - 3. Install a new fully adhered unreinforced 60 mil thick EPDM roofing system, including a vapor barrier on concrete deck areas, insulation, a cover board, flashing, stripping and related accessories.
 - 4. Provide miscellaneous mechanical, electrical, hoisting and other work needed, and remove, adjust, modify, reset and reconnect all roof-mounted and roof-penetrating equipment.
 - 5. Install new flashings at the roof drains, and all roof-mounted and roof-penetrating equipment.
 - 6. Disconnect and remove abandoned mechanical equipment and curbs, and infill the roof deck.
 - 7. Cover new and existing rooftop ductwork with isocyanurate insulation and fully adhered unreinforced EPDM. Configure the insulation so the top surfaces slope for drainage. Install two coats of roller applied acrylic color coating on the EPDM duct wrap.
 - 8. Refasten loose sections of the roof decks as Base Bid work.
 - 9. Repair deterioration less than 1/2 inch deep in the surface of the existing concrete, gypsum and structural wood fiber plank decks as Base Bid work.

10. Protect roof surfaces where material and equipment are 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. Related Requirements

1. Masonry Maintenance - Section 04 0100
2. Carpentry - Section 06 1000.1
3. Sheet Metal Flashing & Specialties - Section 07 6200.1
4. Roof Accessories - Section 07 7200

1.3 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. Underwriters Laboratories Inc. Standard 1256 for roof assemblies with foam insulation.
4. 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 - 150 psf

B. Provide written certification from the roof material Manufacturer, before beginning work, to confirm the roofing system meets these requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. 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.
 1. Submit the supervisor's resume upon request.
2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design within fifty miles 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. Submit the reference list upon request.

3. 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.
- B. Material Quality: Obtain each product, including the insulation, cover board, roof and flashing sheets, and the cements, primers and adhesives from a single Manufacturer which has manufactured the same products in the United States of America for not less than 5 continuous years.
- C. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.

1.5 PRE-CONSTRUCTION CONFERENCE

- A. Meet at the project site approximately two weeks prior to starting work, with the Architect, Owner and other representatives to discuss the following:
 1. How the building will be kept watertight as old roofing is removed and the work progresses.
 2. How new roofing will be coordinated with the installation of the vapor barrier, thermal barrier, insulation, cover board, flashings 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 (deck), curbs, penetrations and other preparatory work needed.
 5. Incomplete submittals; note that progress payments will be not 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 Architect inspections.

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. Written certification from the Manufacturer which states that the Installer is acceptable or licensed to install the specified roofing; if not previously provided.
 3. Manufacturer's technical literature for all materials.
 4. Samples of the Contractor's Guarantee and Manufacturer's warranty forms.
 5. Test reports and certifications substantiating compliance with specification requirements if requested by the Architect.
- 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.
- D. Payment requisitions will not be processed until all submittals are received and approved.

1.7 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.

1.8 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, except sealed cans of adhesives, with watertight tarpaulins installed immediately upon delivery.
- C. Immediately remove insulation which gets wet from the job site.
- D. Store and install all material within the Manufacturer's recommended temperature range.
- E. Do not overload the structure when storing materials on the roof.
- F. Protect roof surfaces where material and equipment are 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 AND WARRANTY

- A. Provide a written Manufacturer's Full System Warranty which warrants that the roofing system, including the insulation, cover board, EPDM roofing and flashings, will remain in a watertight condition for twenty years beginning upon Final Completion.
 1. Guarantee coverage shall remain in effect for gust wind speeds up to 72 miles per hour, measured at ground level at the site.
 2. Guarantee coverage shall have no dollar value limit.

- B. 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 five years beginning upon Final Completion:
 - 1. Defects include but are not limited to the following: leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, joint separation, movement and undue expansion or shrinkage.
 - 2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as guaranteed 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 remain in effect for gust wind speeds up to 72 miles per hour, measured at ground level at the site.
 - 5. Guarantee coverage shall have no dollar value limit.
- C. Provide one Contractor's Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple Sections.
- D. The Manufacturer's Warranty and Contractors Guarantee shall take effect no more than 30 days before the completion of all punch list work.
- E. 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.
- F. Guarantee and 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.
 - 1. 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.

1.10 SUBSTITUTIONS

- A. 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 five completed similar projects of comparable size, with a successful functional history of at least five years, within approximately fifty mile radius of the Project.
 - 4. Technical aspects of the system, especially relating to durability, serviceability and performance.
 - 5. The Manufacturer's ability and history providing technical support, on-site inspections and in progress assistance.

6. The availability and experience of local authorized applicators to install and maintain the proposed alternate system.
7. The Manufacturer's willingness and history responding to warranty claims previously made by the Owner, Architect or Consultant's involved in this project.

PART 2 - PRODUCTS

2.1 GENERAL

- A. EPDM roof system components are specified as products of Firestone Building Products Company to establish a standard of quality. Equal products and systems from Carlisle SynTec or Johns Manville will be accepted.
- B. 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
 9. Acrylic coating

2.2 EPDM

1. Unreinforced 60 mils thick, fire retardant, EPDM (Ethylene Propylene Diene Monomer) sheet membrane conforming to the following minimum physical properties.

PROPERTY	TEST METHOD SPECIFICATION	
Color	—	Gray/Black
Tensile Strength	ASTM D-412	1305 psi min.
Elongation	ASTM D-412	300% min
Tear Strength	ASTM D-624	150 lb/in min
Ozone Resistance	ASTM D-1149	No cracks, 7 days/100 pphm/100°F/50% strain
Heat Aging	ASTM D-573	1200 psi min@ 200% elongation/4 wks/240°F
Brittleness Temperature	ASTM D-746	-49°F
Water Vapor Permanence	ASTM E-96	2.0 perm max
Thickness	ASTM D-412	60 mils plus/minus 6 mils
Fire Retardant		UL Class A

2.3 RELATED MATERIALS

- A. Cleaners, adhesives, sealants, caulking and fasteners furnished by the EPDM system Manufacturer, that comply with low VOC regulations in effect at the time of application.
 1. 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.
 2. Bonding Adhesive: High strength contact adhesive.
 3. Splice Adhesive: High strength synthetic polymer based contact cement formulated specifically to splice EPDM sheets.

4. Lap Sealant: EPDM rubber based gun grade sealant.
 5. Water Block Seal: One component low viscosity butyl rubber sealant.
 6. Pre-Molded Pipe Flashing: Pressure sensitive prefabricated flashings with pre-applied adhesive.
 7. Pourable Sealer: Two component, solvent free polyurethane based sealant.
 8. Reinforced Perimeter Fastening Strips: .030 inch thick reinforced cured EPDM.
 9. Seam Tape Primer: Synthetic rubber polymer based primer designed to clean and prime seam tape splice areas prior to installing the tape.
 10. Seam Splice Tape: Nominal 30 mil thick cured polymer self adhesive tape with release paper carrier, 6 inches wide.
 11. Plates and Bars: Galvanized and corrosion resistant specialty products.
 12. Fasteners: #14 Fluorocarbon polymer coated heavy duty screws.
- B. 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.
- C. Gypsum Cover Board: 1/4 inch thick fire resistant gypsum board decking with inorganic glass mat facers and a water resistant core, formulated in 48 x 48 inch square edge boards, UL Class A, meeting ASTM C-1177, manufactured under the trade name Dens-Deck Prime.
- D. Insulation: Flat and tapered rigid cellular polyisocyanurate boards with fibrous felt/fiberglass mat facers, minimum compressive strength 20 psi, meeting ASTM C1289-01, Type II, Class I, Grade 2, as manufactured by Firestone under the trade name of "ISO 95+ Isocyanurate Insulation". Minimum thickness as shown on the roof plan.
1. Tapered insulation sloping 1/8 inch per foot.
 2. Crickets sloping 1/4 inch per foot.
- E. Tapered edge strips – high density isocyanurate or wood fiberboard strips installed at the drain sumps, and insulation transition points.
- F. 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.
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.
- G. Acrylic Color Coating: Latex based acrylic coating containing 67% solids by weight, resistant to heat, cold water, ozone, ultraviolet rays, and intended for installation on weathered EPDM. Custom color tint as selected by the Architect.
- H. Concrete Grout: Fast setting Portland cement based polymer modified repair mortar as manufactured by The Quikrete Companies, under the trade name Quick-Setting Cement, or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install the new roofing system in a watertight, workmanlike manner, meeting the guarantee requirements specified herein; in accordance with the drawings and in conformance with the Manufacturer's requirements, except as enhanced by the drawings and specifications.
- B. Perform work next to roof mounted mechanical equipment, so the work coincides with equipment shutdown periods and does not affect building occupants. Temporarily cover and protect equipment openings, and windows next to the work area, with 6 mil fire retardant polyethylene, so dirt, dust and odors do not enter the equipment or building. Remove covers as soon as the work is complete and at the end of each workday.
- C. Clean substrate surfaces of all laitance, dirt, oil, grease or other foreign matter.
- D. Remove debris daily and as it is generated. Do not stock-pile debris on the roof. Do not leave any debris on the roof at the end of the day. Do not overload the roof structure when moving debris.
- E. Install roof system components on dry surfaces only. Do not install any components when the weather and outside temperatures are not suitable in accordance with the Manufacturer's recommendations.
- F. Complete all work including the equipment flashings, in sequence as quickly as possible so the smallest area possible is under 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.
- G. Protect roof surfaces where material and equipment are 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.

3.2 SUBSTRATE INSPECTION

- A. Remove existing roofing, insulation, flashings, underlayment material, and the vapor barrier and carefully check the existing deck to confirm it is well secured to the underlying structure and not rotted or otherwise deteriorated.
- B. Immediately notify the Architect and Owner by telephone and in writing if defects in the substrate are discovered.
- C. Maintain the building watertight in the interim, but do not install new roof system components until defects have been corrected.

3.3 DECK REPAIRS

- A. Gypsum deck repairs:
 - 1. Remove damaged and deteriorated gypsum decking and form board, from bulb T to bulb T, in locations where portions are missing or damaged beyond surface repairs or patching.
 - 2. Retain about 6 inches of existing wire mesh reinforcement at the perimeter of the removal area.
 - 3. Install new form board, which matches the type and thickness of the existing form board, and with the underside painted to match the surrounding pieces of form board if exposed to view.
 - 4. Install new metal reinforcement mesh, and connect the ends of the new reinforcement to the ends of the reinforcement in the adjoining decking.
 - 5. Install (pour) new gypsum decking to match the type, thickness and slope of existing decking.

B. Steel or wood deck repairs:

1. Remove damaged and deteriorated decking across the entire width of individual sections by a length equal to a minimum of two joist bays.
2. Install new deck to match the thickness, gauge and cross section of the existing deck. New steel deck shall be galvanized, new wood deck shall be APA rated CDX plywood, or tongue and groove wood planks to match the existing deck.
3. Fasten new decking to each joist with #10 screws spaced 6 inches on center.
4. Stitch side seams of steel deck with #10 screws spaced 24 inches apart.
5. Fasten 4 inch and wider wood deck boards with at least two #10 screws in each joist.

C. Structural wood fiber (SWF) and concrete plank deck repairs:

1. Remove damaged planks in their entirety.
2. Install new planks to match the thickness of adjoining planks, and to fill the void where planks were removed,
3. Secure each new plank with galvanized clips at each joist.
4. Fill spaces between planks with quick setting non shrink cement grout.

D. 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 Architects attention for his review and direction.

3.4 VAPOR BARRIER CONCRETE DECKS

- A. Install primer and a vapor barrier on the concrete decks: 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. Fasten all layers of insulation only to the top flute of steel decks, and to wood decks, with screws and discs which penetrate through the deck a minimum of 3/4 inch and a maximum of 1-1/2 inches.

1. Install 16 fasteners per 4 by 8 foot insulation board in the field of the roof.
 2. Install 28 fasteners per 4 by 8 foot insulation board in 8 foot wide perimeter zones.
 3. Install 32 fasteners per 4 by 8 foot insulation board in 8 foot square corner zones.
 4. 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, and to ensure the screws do not damage conduits mounted on the underside of the deck.
 5. Perform pull tests using the intended fasteners, on each roof area before beginning work, and obtain the Manufacturer's written approval of the fastener that will be used.
- D. On concrete, gypsum and structural wood fiber deck areas 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 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 8 foot wide perimeter zones.
 3. Install 1/2 inch diameter adhesive beads 4 inches on center in 8 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.

3.6 EPDM

- A. Place EPDM roofing on the substrate without stretching it, and allow it to relax approximately one hour – before starting to adhere it to the substrate and form the seams.
- B. Place adjoining sheets in the same manner lapping the edges to shed water.
- C. Fully adhere EPDM to the substrate with bonding adhesive.
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 day's use.
 4. Allow bonding adhesive to dry to the touch before joining the EPDM to the substrate.
 5. Roll the EPDM onto the dried bonding adhesive and immediately rub it vigorously with a soft bristle broom to ensure complete adhesion.
- D. 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 EPDM roof splices with 6 inch wide field applied seam tape, or with 3 inch wide factory applied seam tape.
1. Fold the top sheet back and clean mating surfaces using clean rags with splice wash.

2. Scrub a smooth coat of QuickPrime onto mating surfaces, with long strokes, and to obtain complete coverage, using approximately 1 gallon per 225 square feet. Do not allow the QuickPrime to glob, streak or puddle; allow it to dry to the touch before installing the seam tape.
 3. Seam tape shall be positioned so 1/8 inch minimum and 1/2 inch maximum will be exposed at the seam edge 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 splice tape release paper from within the seam 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.
- B. Install uncured EPDM target patches with rounded corners, over all T-Seam intersections.

3.8 PERIMETER FASTENING

- A. Secure the EPDM at the perimeter of each roof level, and at eaves, penetrations, expansion joints and slope changes greater than 1 inch in 12 inches. Utilize surface applied discs or adhere the EPDM to continuous reinforced EPDM fastening strips. Secure the discs and EPDM fastening strips 12 inches on center.

3.9 FLASHINGS

- A. 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 6 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 a cap flashing.
- B. Install premolded pipe flashings wherever possible. Where premolded pipe flashings cannot be installed, use field wrapped flashings. Install sealant pockets as a last resort.
- C. 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.

3.10 DUCT WRAP WATERPROOFING:

- A. Remove existing duct covering material; and re-cover existing ductwork with isocyanurate insulation and fully adhered 60 mil thick EPDM roofing.
- B. Install insulation and EPDM duct covering on new roof top ducts.

1. Install EPDM cover strips and target patches to seal all duct air leaks before covering them.
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.

3.11 ACRYLIC COLOR COATING:

- A. Install two roller applied coats of acrylic color coating, only after the EPDM duct coverings and flashings are complete and approved in writing by the Manufacturer and Architect.
- B. Field tint the acrylic coating to the color selected. Batch mix the coating in a drum or similar large container to achieve a consistent color.
- C. Apply the coating to achieve a neat uniform color coated surface free of roller and brush marks or adhesive bleed through.

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 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 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 leaks and damage that weren't 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.

3.14 ROOF INSPECTIONS BY MANUFACTURER

- A. Arrange for the roofing Manufacturer, or his authorized representative, to make a minimum of five inspections in accordance with the following schedule and submit a written report of each inspection to the Architect.
 - 1. First inspection during the first two days of new roof installation.
 - 2. Second inspection when roofing is approximately one third complete.
 - 3. Third inspection when roofing is approximately two thirds complete.
 - 4. Fourth inspection when all roofing and flashings are installed.
 - 5. Final inspection at the completion of all work.
- B. Provide 48 hours advance written notice to the Architect, so he may have a representative attend the inspections.
- C. Submit the inspection reports within one week following each inspection.
 - 1. Payment requisitions will not be reviewed nor approved until the inspection reports are received.

END OF SECTION

SECTION 07 6200.1
SHEET METAL FLASHINGS & SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings, schedules and keynotes, 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, and miscellaneous flashings.

B. Related Requirements

- | | |
|------------------------|-------------------|
| 1. Masonry Maintenance | - Section 04 0100 |
| 2. Carpentry | - Section 06 1000 |
| 3. EPDM Roofing | - Section 07 5323 |
| 4. Roof Accessories | - Section 07 7200 |

1.3 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.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. 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.
 1. Submit the supervisor's resume upon request.
2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within fifty miles 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. Submit the reference list upon request.

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.

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 Architect inspections.

1.5 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. Manufacturer's technical literature for all materials.
3. Test reports and certifications substantiating compliance with specification requirements if requested by the Architect.
4. Shop drawings, or 2 foot long samples, for each sheet metal item, to show how it relates and fits 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. A 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.
 - D. Payment requisitions will not be processed until all submittals are received and approved.
- 1.6 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, and all other items of sheet metal and related work, for inspection and approval by the 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.
- 1.7 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 roof surfaces where material and equipment are 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.
- 1.8 GUARANTEE
- 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 five years 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 FreedomGray Copper by Revere.
- C. Solder:
1. 50-50 tin and lead for plain copper, supplied in one pound bars with the alloy mixture stamped into the bar by the Manufacturer.
 2. Lead free / or pure tin solder for zinc-tin coated copper, Number 497 by Johnson Manufacturing.
- D. Flux:
1. Water-Soluble Liquid Flux, Kester #3345 for iron soldering of brass and copper.
 2. Tin-bearing flux such as "Flux-N-Solder E127 with pure tin" by Johnson Manufacturing.
- E. Shop fabricated aluminum fascias, hook strips, and miscellaneous trim for all other roof areas with #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. Factory Fabricated Roof Edge System: Extruded aluminum anchor bars secured with #9 stainless steel screws spaced 12 inches on center and .050 inch thick Kynar 500 prefinished aluminum trim covers, independently tested to comply with the ANSI / SPRI ES-1 Wind Design Guide, provided by the roofing membrane manufacturer.
- G. Fasteners: fabricated of stainless steel, or material that matches the sheet metal being fastened.
- H. Underlayment: one ply of high temperature ice & water shield and one ply of 5 pound rosin paper.

- I. Eveco ventilators: single cone gravity type ventilators, with no moving parts, fabricated of mill finish aluminum, furnished with #8 aluminum insect screen, 1/2 inch aluminum bird screen and factory fabricated curb mount bases, as manufactured by Empire Ventilation Equipment Co., Inc., Long Island City, NY.
- J. Glass Cloth: open mesh glass fabric coated on each side with plasticized asphalt as manufactured by Karnak Corporation or equal.
- K. Asphalt cement: Federal Specification SS-C-153B, Type 1, asbestos free grade.
- L. 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.
- M. Ice and Water Shield: high temperature 30 mil thick slip resistant butyl based adhesive coated sheet, with a plastic release layer for peel and stick application directly to a prepared roof deck: Grace Ultra.

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 above all roof and roof flashing components, including copings, wall penetrating ducts and gravel stops. Install cap flashings built into masonry walls; as they are demolished as shown, and as they are constructed - 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 back up 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 skylight and 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 or skylight to the curb with stainless steel screws spaced 12 inches on center.

3.5 DRIP EDGES

- A. Fabricate drip edges to extend 1-1/2 inches past the roof edge, and turn down to ensure water cannot track back and run down the fascia. Secure the drip edge with roofing nails along the top edge, spaced 4 inches apart along the raw metal edge. Form joints in the drip edge with 6 inch wide concealed under plates which duplicate the profile of the drip edge. Set the underplates in a full bed of sealant.

3.6 HOOK STRIPS

- A. Form continuous hook strips with locks that engage the superimposed trim piece a minimum of 3/4 inch, and to cover the entire underside edge of the wood blocking and neatly extend to the building wall.

- B. Fasten hook strips along their bottom edge, just above the 45 degree bend, with nails spaced 4 inches on center into underlying wood blocking; Zamac type nail-in type fasteners spaced 8 inches on center into masonry surfaces, or screws spaced 8 inches on-center into sheet metal surfaces.

3.7 FASCIA

- A. Fabricate new fascia to engage the hook strip 3/4 inch minimum and extend to the top of the wood fascia blocking. Secure the fascia with a continuous hook strip along the bottom edge and roofing nails along the top edge spaced 8 inches apart, positioned to be covered by the roof edge trim. Form joints in the fascia with 6 inch wide concealed under plates which duplicate the profile of the fascia. Set the underplates in a full bed of sealant.

3.8 ROOF EDGE SYSTEM

- A. Install a factory fabricated roof edge system on all roof eaves.
 - 1. Extend the roof to lap over and down the face of the fascia trim, so it stops just short of the bottom edge of the anchor bar.
 - 2. Install the anchor bar straight, level and true, set in a full bed of sealant, and secure the bar with #9 by 2 inch long stainless steel screws spaced no more than 12 inches apart.
 - 3. Pre-drill screw holes in the underlying metal fascia trim, where extra fasteners are needed, and at corners and special conditions.
 - 4. Install color matching under plates at each joint in the roof edge trim; set the under plates in a full bed of sealant.

3.9 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 pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks and damage that weren't 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 work areas watertight each day.
- 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 are neat, orderly and workmanlike. 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.

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. Precast concrete splash pads.

1.2 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- 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. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on prefabricated components.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Pre-Finished Aluminum Sheet: ASTM B209 (ASTM B209M); 0.032 inch (0.8 mm) thick.
 - 1. Finish: Plain, shop pre-coated with PVDF (polyvinylidene fluoride) coating.
 - 2. Color: As selected from manufacturer's standard colors.

2.2 COMPONENTS

- A. Gutters: SMACNA rectangular style profile.
- B. Downspouts: SMACNA Rectangular profile.
- C. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 1. Gutter Supports: Brackets. Interlocked into front edge of gutter. Screwed to structural back-up.
 - 2. Downspout Supports: Brackets.
- D. Fasteners: Galvanized steel, with soft neoprene washers.

2.3 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. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

2.4 FINISHES

- A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604, multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.5 ACCESSORIES

- A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3,000 psi (21 MPa) at 28 days, with minimum 5 percent air entrainment.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that surfaces are ready to receive work.

3.2 PREPARATION

- A. Finish paint all trim and siding prior to starting gutter installation.

3.3 INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
- B. Slope gutters 1/4 inch per foot (18 mm/m).
- C. Install gutter support brackets 16" o.c. max.
- 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 Supplementary Conditions and 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 drawings, schedules and keynotes, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Roof specialties that are compatible with the roofing systems specified, including:
 - a. Plastic skylights.
 - b. Wall louvers.
 - c. Pre-fabricated curbs and equipment supports.
 - d. Factory fabricate pipe curb portals
 - e. Drains, drain pipes and couplings.
 - f. Pipe insulation and fitting covers.
 - g. Galvanized steel roof access ladders and stairs.
 - h. Gas line and equipment pipe supports.
 - i. Roof walkway pads and concrete pavers.
2. Prepare, prime and paint all roof top equipment, the access ladders, equipment support dunnage, bulkhead doors and frames (inside and outside) and miscellaneous rooftop items indicated.

B. Related Requirements

- | | |
|---------------------------------------|---------------------|
| 1. Masonry | - Section 04 5000 |
| 2. Carpentry | - Section 06 1000.1 |
| 3. EPDM Roofing | - Section 07 5323 |
| 4. Sheet Metal Flashing & Specialties | - Section 07 6200.1 |

1.3 CODE APPROVAL REQUIREMENTS

- A. Fabricate and install roof accessories that comply with the NY State Uniform Fire Prevention and Building Code.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. 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.
 1. Submit the supervisor's resume upon request.

2. 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, and the Contractor's Supervisor's name.
 - b. Submit the reference list upon request.
- B. Material Quality: 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.
- 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 roof accessory work will be coordinated with the installation of the vapor barrier, thermal barrier, insulation, cover board, roofing, flashings, 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, forecast weather, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
 7. A schedule for Manufacturer and Architect inspections.

1.5 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 work starts.
 2. Manufacturer's installation instructions and technical data sheets for each item. Material sample submittals are not needed unless requested to show color and texture.
 3. Samples of the Contractor's and Manufacturer's guarantee/warranty forms.
 4. Test reports and certifications substantiating compliance with specification requirements if requested by the Architect.
- 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.
- D. Payment requisitions will not be processed until all submittals are received and approved.

1.7 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 roof surfaces where material and equipment are 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.

1.8 GUARANTEE

- 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 five years beginning upon Final Completion:
 1. Defects include but are not limited to the following: peeling paint, leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, movement 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 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 shall take affect no more than 30 days before the satisfactory completion of all punch list work.
- 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. Provide a Manufacturer's written warranty, which warrants the skylights will remain watertight for a minimum 5 years beginning upon final completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide Manufacturer's standard units, modified as necessary to comply with the specified requirements. Fabricate each unit in a shop to the greatest extent possible, using the following components:
1. Aluminum Sheet: ASTM B 209 alloy 3003, tempered for forming and performance; mill finish, except as otherwise noted.
 2. Extruded Aluminum: Standard extrusions alloy 6063-T52; 0.078 inch minimum thicknesses for primary framing and curb member legs, 0.062 inch thickness for secondary framing and covers; mill finish, except as otherwise indicated.
 3. Insulation: Rigid fiber glass boards where encapsulated inside metal skirts, rigid isocyanurate where covered with roof flashings on the exterior of curbs.
 4. Wood Nailers: Dimension grade Douglas Fir, not less than 1-1/2 inches thick.
 5. Fasteners: Nonmagnetic stainless steel or hot dipped galvanized steel, to match the finish of the material being fastened.
 6. Gaskets: Tubular neoprene or polyvinyl chloride, or block sponge neoprene.
 7. Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

2.2 PLASTIC SKYLIGHTS

- A. Factory assembled dome and frame assemblies with welded corners manufactured by Kingspan / Bristolite or American Skylights are specified to establish a quality standard. Equal products are acceptable provided they comply with the following requirements:
1. Glazing sheet thickness required for a minimum of 30 pounds per square foot external and 30 pounds per square foot internal loading; and to comply with the minimum thickness and wind pressure requirements of AAMA/WDMA/CSA 101/I.S.2/A440 as set forth in paragraph 2405.5 of the NYS Uniform Fire Prevention and Building Code.
 2. Outer Dome: Dome shaped polycarbonate meeting the following tests:
 - a. Burn Rate ASTM D635 - Not over 2.5
 - b. Smoke Developed ASTM D2843
 - c. Smoke Density Not over 75%
 3. Inner Panel: Clear multiwall polycarbonate panel meeting the following tests:
 - a. Burn Rate ASTM D635 - Not over 2.5
 - b. Smoke Developed ASTM D2843
 - c. Smoke Density Not over 75%
 4. Fall Protection: Fabricate the skylights so the dome and panel will not disengage from the frame upon impact of 755 foot pounds, and to comply with OSHA 1910.23 Fall Protection Guidelines.
 5. Energy Performance Ratings:
 - a. Maximum U-Value 0.50
 - b. Maximum Solar Heat Gain Coefficient (SHGC) of 0.40
- B. Curb Construction: Provide units with integral internal gutters and weep holes to drain condensation; fabricated with formed and extruded thermally broken welded aluminum frames and retaining angles for installation on field constructed curb assemblies.

2.3 WALL LOUVERS

- A. Factory fabricated wall louvers to fit within the revised wall openings, incorporating 4 inch deep, .081 inch thick extruded aluminum louver blades, hidden mullions, extruded aluminum frames, 18-14 aluminum mesh insect and bird screens manufactured by United Enertech.

2.4 PRE-FABRICATED CURBS AND EQUIPMENT SUPPORTS

- A. Factory fabricated of welded 14 gauge galvanized steel, insulated with minimum 1-1/2 inch thick 3 pound density rigid insulation, with nominal 2 by 2 inch wood nailers and T bar reinforcing on sides

longer than 36 inches; height to extend above the finished roof surface a minimum of 10 inches, Model ES-2 by Pate Inc.

- B. Where the roof deck slopes more than 1/4 inch per foot, provide tapered curbs to match the slope, and install the equipment level.

2.5 FACTORY FABRICATED PIPE CURB PORTALS

- A. Factory fabricated flashing systems, consisting of 9 inch high internally insulated galvanized steel curbs with 1-1/2 inch square wood nailers at the top edges, and 5 hole EPDM boots, with nipples that will accommodate pipes and conduits from 1/2 to 2-1/2 inches in diameter, with stainless steel hose clamps on each nipple - 5-Hole Pipe Portal Flashing System: C-555, by Portals Plus or equal.

2.6 DRAINS, DRAIN PIPES, AND COUPLINGS

- A. Conventional cast iron bottom and side outlet roof drains, installed with drain receivers, under deck clamps, cast iron strainers, cast iron clamping rings and factory installed stainless steel gravel screens Series 1011 as manufactured by Jay R. Smith Manufacturing Company.
- B. Cast iron overflow roof drains with water dam, installed with drain receivers, under deck clamps, cast iron strainers, cast iron clamping rings and factory installed stainless steel gravel screens Series 1080 as manufactured by Jay R. Smith Manufacturing Company.
- C. Match the drain outlet size and style to the building drain line, 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.
- D. Drain pipe: cast iron pipe with no hub fittings, minimum 3 inch diameter, and larger to match the existing building drain lines.
- E. 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.

2.7 PIPE INSULATION AND FITTING COVERS

- A. Insulation: minimum 1 inch thick pre-molded 3.5 lb. heavy density 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 25 and a maximum Smoke Developed Value of 50 in accordance with ASTM E8450.

2.8 GALVANIZED STEEL ROOF ACCESS LADDERS AND STAIRS

- A. Fabricate ladders from 1-1/4 inch inside diameter steel pipe rails, spaced 22 inches apart, and 3/4 inch solid steel rebar rungs spaced 12 inches on center. Fit the rungs into drilled holes in the centerline of the rails, weld and grind the welds smooth. Extend the ladder rails and form goose-neck returns to finish 42 inches above the roof surface.
 - 1. Hot dip galvanize coat the ladder and mounting brackets after fabrication. Install with Type 316 stainless steel hardware.

2.9 GAS LINE AND EQUIPMENT PIPE SUPPORTS

- A. Factory fabricated adjustable pipe supports as manufactured by Miro Industries, Inc. Model 20-Base Strut-12.

2.10 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.
- B. 30 inches by 30 inches hard rubber black walkway pads manufactured by Firestone.

2.11 PAINT AND PRIMER

- A. Alkyd base rust inhibiting exterior primer and high gloss finish paint for ferrous metal surfaces as manufactured by Rust Oleum or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Field measure existing openings. Comply with manufacturer's instructions and recommendations. Coordinate with the installation of roof deck, other substrates to receive specialty units, vapor barriers, roof insulation, roofing and flashing to ensure that each element of the work performs and fits properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

3.2 PLASTIC SKYLIGHTS

- A. Skylights on field constructed curbs: Remove the existing skylight and curb assembly using care not to damage the roof deck or skylight well liner. Re-support ceiling and shaft components that are attached to the skylight curb or shaft liner. Construct or extend the existing curb to finish 10 inches above the roof surface. Install new base and cap flashings, and restore & finish the shaft liner to match the original construction. Install the new skylight on top of a 1/2 inch by 2 inch foam gasket.

3.3 LOUVERED PENTHOUSE VENTILATORS

- A. Construct a wood curb to extend 10 inches above the roof surface. Install new base and cap flashings, restore the curb liner to match the original construction, and install the penthouse assembly on top of a 1/2 inch by 2 inch foam gasket.

3.4 WALL LOUVERS

- A. Modify and rebuild the wall openings, and install the new louvers slightly recessed from the exterior wall surface, over a tin coated copper cap flashing at the sill. Create 1/2 inch wide sealant joint at the perimeter of the louvers, with weep holes spaced 12 inches on center along the sill.

3.5 PRE-FABRICATED CURB AND EQUIPMENT SUPPORTS

- A. Install curb assemblies directly on the structural deck or block solid under the assembly to achieve the height shown and to install the curb assembly level.
- B. Install new base and cap flashings prior to installing the mechanical equipment. Set mechanical equipment on 1/2 inch thick anti vibration pads.

3.6 FACTORY FABRICATED PIPE CURB PORTALS

- A. Install factory fabricated pipe portal flashing systems at all HVAC units, 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.
 - 2. Disconnect and reconnect refrigerant, power, control and condensate lines and pipes as needed to install the pipes through the flashing nipples.
 - a. Install water cut off sealant between the lines / pipes and EPDM nipples, and then install a hose clamp on each nipple.
 - b. Remove and replace nipples that are incorrectly cut too large.

3.7 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. Connect the fittings and sections of cast iron pipe using heavy duty no-hub couplings; solvent weld PVC fittings and pipe, and use threaded connections to join steel fittings and pipe.
- D. 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 rely on the couplings to support any weight. Do not hang the drain pipes from the roof deck.

3.8 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.

3.9 GALVANIZED STEEL ROOF ACCESS LADDERS

- A. Install ladders at the interior and exterior locations shown. Support and secure each ladder at the top and bottom and at intermediate points spaced a maximum of 5 feet on center. Use bolted steel brackets, anchored with 1/2 inch diameter stainless steel epoxy set bolts. Space the ladders to provide 7 inches of toe clearance. Extend the rails 42 inches and goose-neck form them to provide additional support at the top of the ladder.
- B. Install new stairs at the exterior locations shown. Set the stairs on new concrete pavers over walkway pads. Secure the stairs to the pavers with stainless steel Zamac Nail-ins.

3.10 GAS LINE AND EQUIPMENT PIPE SUPPORTS

- A. Install pipe supports spaced five feet on center over a concrete paver and a walkway pad.
- B. Fasten pipes and conduits to the new pipe supports with new stainless steel clamps.

3.11 ROOF WALKWAY PADS AND CONCRETE PAVERS

- A. Install hard rubber walkway pads to provide a path 2-1/2 feet wide where shown, and at all roof access points, i.e., doors, ladders and hatches, under concrete pavers used for conduit and pipe supports, and around all HVAC equipment.
 - 1. **Adhere each pad with five self adhesive strips - do not install the pads using three strips of tape as supplied by the manufacturer.**

3.12 PAINTING

- A. Scrape and wire brush roof top equipment, ladders, access doors and frames (both sides) and the vent pipes to remove loose and peeling paint and surface rust.
- B. Install one coat of primer and two finish coats of paint using a brush or roller. Wait 24 hours for each coat of paint to dry before applying the next coat.

3.13 MISCELLANEOUS

- A. Provide and install any sealants needed, where shown or required.
- B. Perform mechanical and electrical work using skilled and licensed tradesmen.
- C. Provide new material, couplings, transition pieces, blocking, fasteners and the similar accessories needed to complete the work.

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 pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks and damage that weren't 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 are neat, orderly and workmanlike. 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.

END OF SECTION

**SECTION 07 8400
FIRESTOPPING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of all penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not.

1.2 RELATED REQUIREMENTS

- A. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.3 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.
- C. FM 4991 - Approval Standard for Firestop Contractors; 2013.
- D. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- E. UL (FRD) - Fire Resistance Directory; current edition.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.

1.5 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

PART 2 PRODUCTS

2.1 FIRESTOPPING - GENERAL REQUIREMENTS

- A. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.2 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use any system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
- B. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 - 1. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
 - 2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.

2.3 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

- A. Penetrations By:
 - 1. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 1 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - 2. Electrical Cables Not In Conduit:
 - a. 1 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.

3. Insulated Pipes:
 - a. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
4. HVAC Ducts, Insulated:
 - a. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

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 matter that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.

3.3 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

3.4 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.5 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

**SECTION 07 9005
JOINT SEALERS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sealants and joint backing.

1.2 REFERENCE STANDARDS

- A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- C. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell); 2005 (Reapproved 2011).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with other sections referencing this section.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.6 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PART 2 PRODUCTS

2.1 SEALANTS

- A. Sealants and Primers - General: Provide products having volatile organic compound (VOC) content as specified in Section 01 6116.
- B. General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25 minimum; Uses M, G, and A; single component.
 - 1. Color: Match adjacent finished surfaces.
 - 2. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between metal frames and other materials.
 - 3. Polyurethane Products:
 - a. Pecora Corporation; DynaTrol I-XL General Purpose One Part Polyurethane Sealant: www.pecora.com.
 - b. Sika Corporation; Sikaflex-1a: www.usa-sika.com.

2.2 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Backing: Round foam rod compatible with sealant; ASTM D1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- C. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

- B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

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. Install bond breaker where joint backing is not used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Tool joints concave.

3.4 CLEANING

- A. Clean adjacent soiled surfaces.

3.5 PROTECTION

- A. Protect sealants until cured.

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 reinforced polyester (FRP) doors.
- B. Factory installed Finish Hardware
- C. Aluminum Frames

1.3 REFERENCE STANDARDS

- A. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. ASTM D 543 - Evaluating the Resistance of Plastics to Chemical Reagents
- D. ASTM D 570 - Water Absorption of Plastics
- E. ASTM D 638 - Tensile Properties of Plastics
- F. ASTM D 790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- G. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics
- H. ASTM D 1623 - Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
- I. ASTM D 2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging
- J. ASTM D 2583 - Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
- K. ASTM D 5420 - Impact Resistance of Flat Rigid Plastic Specimens by Means of a Falling Weight.
- L. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products
- M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- N. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007.
- O. ASTM E 90 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- Q. ASTM E 283 - Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- R. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- S. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- T. ASTM F 476 - Security of Swinging Door Assemblies.
- U. ASTM F 1642-04 - Standard Test Method for Glazing Systems Subject to Air blast Loading.
- V. NWWDA T.M. 7-90 - Cycle Slam Test Method
- W. SFBC PA 201 - Impact Test Procedures.
- X. SFBC PA 203 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
- Y. SFBC 3603.2 (b)(5) - Forced Entry Resistance Test.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
- B. Air Infiltration: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 283 at pressure differential of 6.27 psf. Door shall not exceed 0.58 cfm/ft².
- C. Water Resistance: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 331 at pressure differential of 7.50 psf. Door shall not have water leakage.
- D. Indoor air quality testing per ASTM D 6670-01: GREENGUARD Environmental Institute Certified including GREENGUARD for Children and Schools Certification.
- E. Hurricane Test Standards, Single Door:
 - 1. Uniform Static Load, ASTM E 330: Plus or minus 195 pounds per square foot.
 - 2. Forced Entry Test, 300 Pound Load Applied, SFBC 3603.2 (b)(5): Passed.
 - 3. Cyclic Load Test, SFBC PA 203: Plus or minus 53 pounds per square foot.
 - 4. Large Missile Impact Test, SFBC PA 201: Passed.
- F. Hurricane Test Standards, Pair of Doors with single point latching:
 - 1. Uniform Static Load, ASTM E 330: Plus or minus 112.5 pounds per square foot.
 - 2. Forced Entry Test, 300 Pound Load Applied, AAMA 1304: Passed.
 - 3. Cyclic Load Test, ASTM E 1886: Plus or minus 75 pounds per square foot.
 - 4. Large Missile Impact Test, ASTM E 1886: Passed.
- G. Swinging Door Cycle Test, Doors and Frames, ANSI A250.4: Minimum of 25,000,000 cycles.
- H. Cycle Slam Test Method, NWWDA T.M. 7-90: Minimum 5,000,000 Cycles.
- I. Salt Spray, Exterior Doors and Frames, ASTM B 117: Minimum of 500 hours.
- J. Sound Transmission, Exterior Doors, STC, ASTM E 90: Minimum of 25.
- K. Thermal Transmission, Exterior Doors, U-Value, AAMA 1503-98: Maximum of 0.29 BTU/hr x sf x degrees F. Minimum of 55 CRF value.
- L. Surface Burning Characteristics, FRP Doors and Panels, ASTM E 84:
 - 1. Flame Spread: Maximum of 200, Class C.
 - 2. Smoke Developed: Maximum of 450, Class C.
- M. Surface Burning Characteristics, Class A Option On Interior Faces of FRP Exterior Panels and Both Faces of FRP Interior Panels, ASTM E 84:
 - 1. Flame Spread: Maximum of 25.
 - 2. Smoke Developed: Maximum of 450.
- N. Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 256: 14.0 foot-pounds per inch of notch.
- O. Tensile Strength, FRP Doors and Panels, Nominal Value, ASTM D 638: 13,000 psi.
- P. Flexural Strength, FRP Doors and Panels, Nominal Value, ASTM D 790: 21,000 psi.
- Q. Water Absorption, FRP Doors and Panels, Nominal Value, ASTM D 570: 0.20 percent after 24 hours.
- R. S. Indentation Hardness, FRP Doors and Panels, Nominal Value, ASTM D 2583: 55.
- S. T. Gardner Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 5420: 120 in-lb.
- T. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel: Maximum of 0.029 average weight loss percentage.
- U. Stain Resistance, ASTM D 1308: Face sheet unaffected after exposure to red cabbage, tea, and tomato acid. Stain removed easily with mild abrasive or FRP cleaner when exposed to crayon and crankcase oil.

- V. Chemical Resistance, ASTM D 543. Excellent rating.
 - 1. Acetic acid, Concentrated.
 - 2. Ammonium Hydroxide, Concentrated.
 - 3. Citric Acid, 10%.
 - 4. Formaldehyde.
 - 5. Hydrochloric Acid, 10%
 - 6. Sodium hypochlorite, 4 to 6 percent solution.
- W. Compressive Strength, Foam Core, Nominal Value, ASTM D 1621: 79.9 psi.
- X. Compressive Modulus, Foam Core, Nominal Value, ASTM D 1621: 370 psi.
- Y. Tensile Adhesion, Foam Core, Nominal Value, ASTM D 1623: 45.3 psi.
- Z. Thermal and Humid Aging, Foam Core, Nominal Value, 158 Degrees F and 100 Percent Humidity for 14 Days, ASTM D 2126: Minus 5.14 percent volume change.
- AA. Doors shall comply with fire resistance and flammability regulations as interpreted by governing authorities, and as follows:
 - 1. Face sheets tested in accordance with ASTM E84 shall have the following ratings:
 - a. Smoke Developed:
 - a) Not greater than 345 (Class C)
 - b. Flame Spread:
 - a) Not greater than 70 (Class C)
 - 2. **Thermal barrier. Except as provided for in Chapter 26 NYS New York State Sections 2603.4.1 and 2603.8, foam plastic shall be separated from the interior of a building by an approved thermal barrier of 0.5-inch (12.7 mm) gypsum wallboard or equivalent thermal barrier material that will limit the average temperature rise of the unexposed surface to not more than 250°F (120°C) after 15 minutes of fire exposure, complying with the standard time-temperature curve of ASTM E 119. The thermal barrier shall be installed in such a manner that it will remain in place for 15 minutes based on FM 4880, UL 1040, NFPA 286 or UL 1715. Combustible concealed spaces shall comply with Section 717**
 - 3. Submit ICC-ES generated evaluation report that the doors submitted do not require thermal barrier for non rated doors.

1.5 SYSTEM PERFORMANCE:

- A. Provide Door assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below, as demonstrated by testing manufacturer's corresponding stock systems according to test methods designated.
- B. Thermal Transmission (Exterior Doors): U-value of not more than 0.09 (BTU/Hr. x sf x degrees F.) per AAMA 1503.1.

1.6 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.7 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard details, installation instructions, and hardware and anchor recommendations.
- C. Test Reports: Show compliance with specified criteria.
- D. Shop Drawings: Show layout and profiles; include assembly methods. Shop drawings to be prepared by door manufacturer.

1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
 2. Indicate wall conditions, door and frame elevations, at 1/2" scale, half-sized detail sections, materials, gages, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on Drawings to identify details and openings. expansion provisions, and other components not included in the manufacturer's standard data. Include glazing details
- E. Selection Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.
1. Where normal color and texture variations are expected, include two or more units in each sample to show the range of such variations.
- F. Architect reserves the right to require samples of typical fabricated section, showing joints, exposed fastenings (if any), quality of workmanship, hardware and accessory items, before fabrication of the work proceeds.
- G. Door Corner Sample: Submit corner cross sections, 10 inch (254 mm) by 10 inch (254 mm) in size, illustrating construction, finish, color, and texture.
- H. Maintenance Data: Include instructions for repair of minor scratches and damage.
- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Warwick Valley Central School District's name and registered with manufacturer; include detailed terms of warranty.
- J. Maintenance Materials: Furnish the following for Warwick Valley Central School District's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than 20 years of documented experience.
1. Door and frame components from same manufacturer.
 2. Evidence of a compliant documented quality management system.
- 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 installing products of the type specified in this section with not less than five (5) years of documented experience, and approved by the manufacturer..
- E. 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.

1.9 FIELD MEASUREMENT:

- A. 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 may be required, without any additional costs to the Owner.

1.10 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 corrugated 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 (102 mm) above grade, with minimum 1/4 inches (6 mm) space between doors.

1.11 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

1.12 SPECIAL PROJECT WARRANTY:

- A. 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.
- B. Warranty Time Period: Ten Years from substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - 1. Reinforced Fiberglass Doors (FRP)
 - a. Special-Lite, Inc. Decatur, Michigan or approved equal by
 - b. Architectural FRP Door Systems, Bensalam, PA.

2.2 ALUMINUM DOOR FRAMES

- A. Materials and Accessories
 - 1. Aluminum Members: Provide alloy and temper as recommended by manufacturer for strength, corrosion resistance, and application of required finish and control of color; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate, with a minimum wall thickness of 0.125".
 - 2. All materials shall be of the same manufacturer. No splitting of Door and Frame components will be permitted for aluminum frames.
 - 3. Fasteners: Provide Aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, guaranteed by the manufacturer to be compatible with the doors, frames, stops, panels, hardware, anchors, and other items being fastened. For exposed fasteners (if any), provide Phillips head flat head screws with finish matching the item to be fastened.
 - 4. Do not use exposed fasteners, except where unavoidable for the assembly of units, or unavoidable for the fastening of hardware. Provide only concealed screws in glazing stops.
 - 5. Reinforcement and Brackets: Manufacturer's standard formed or fabricated steel units, of shapes, plates, of bars, with 2.0 ounce hot-dip zinc coating, complying with ASTM A 123, applied after fabrication.
 - 6. Expansion Anchor Devices: Lead shield or toothed steel, drilling expansion bolt anchors.
 - 7. Bituminous Coating: Cold applied asphalt mastic complying with SSPC-PS 12, compounded for 30-mil thickness per coat.

8. Sealants and Gaskets: Provide sealants and gaskets in the fabrication, assembly and installation of the work, which are recommended by the manufacturer to remain permanently elastic, non-shrinking, non-migrating and weatherproof.
- B. Door Perimeter Framing
 1. Tubular Framing:
 - a. Heavy Wall Tube Aluminum Framing with Applied Door & Glass Stops. Size and Type: Model: SL-260 Heavy Wall Tube Aluminum Framing with Applied Door & Glass Stops.
 - b. Material: Aluminum Alloy 6063-T5, 0.125-inch minimum wall thickness tube.
 - c. Perimeter Frame Members:
 - a) Box type with 4 enclosed sides.
 - b) Size: 2" x 6".
 - c) Factory fabricated.
 - d) Open-back framing is not acceptable.
 - e) Applied Door Stops:
 - f) 0.625-inch high, with screws and weatherstripping.
 - g) Pressure gasketing for weathering seal.
 - h) Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
 - d. Caulking: Caulk joints before assembling frame members.
 - e. Joints:
 - a) Secure joints with fasteners.
 - b) Provide hairline butt joint appearance.
 - f. Hardware:
 - a) Premachine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
 - b) Factory install door hardware.
 - g. 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.

2.3 FIBERGLASS REINFORCED POLYESTER (FRP) DOORS:

- A. Doors are to be constructed as follows:
 1. Model S-17, 1 3/4" thick.
 2. Constructed of aluminum alloy rails and stiles, joined with steel tie rods.
 3. Stiles to be tubular shape to accept hardware as specified.
 4. Top and bottom rails to be extruded with legs for interlocking "rigidity weather bar."
 5. Joinery to be 3/8" tie rods, top and bottom, bolted through an extruded spline and 3/16" riveted reinforcing angles, and secured with aircraft type nuts. Doors with mid-panels are to have an additional tie rod at the mid-panel.
- B. All doors shall be pre-machined in accordance with templates from the hardware manufacturer. For surface applied hardware doors shall have necessary reinforcement, including the attachment of RIVNUT blind bolt fasteners. With the exception of door closures and holders, which require field applications, doors are to be shipped with hardware attached.
- C. Face sheets to be locked in with extruded interlocking edges. (No Snap-On trim will be accepted.)
- D. Core is to be of Urethane foam of 5 lb. per cubic foot density. All doors are to be properly reinforced for hardware prior to Urethane core foaming in door.

1. **Thermal barrier.** Except as provided in Chapter 26 NYS New York State Sections 2603.4.1 and 2603.8, foam plastic shall be separated from the interior of a building by an approved thermal barrier of 0.5-inch (12.7 mm) gypsum wallboard or equivalent thermal barrier material that will limit the average temperature rise of the unexposed surface to not more than 250°F (120°C) after 15 minutes of fire exposure, complying with the standard time-temperature curve of ASTM E 119. The thermal barrier shall be installed in such a manner that it will remain in place for 15 minutes based on FM 4880, UL 1040, NFPA 286 or UL 1715. Combustible concealed spaces shall comply with Section 717
 2. Submit ICC-ES generated evaluation report that the doors submitted do not require thermal barrier for non rated doors.
- E. Face sheets for FRP Doors are to be .120" thick with Pebble finish, sandstone finish for main entrance doors.
- F. Color as selected by the Architect from Manufactures Standard or Classic Colors. Interior and exterior colors may be different.

2.4 FINISH HARDWARE:

- A. Provide and factory install finish hardware for each door leaf as specified in Division 8 "Finish Hardware".
- B. SL-84, 8-11/16" high, 6" wide, 1-3/8" recess and 1-1/2" bottom opening for FRP doors
- C. SL-301 Concealed adjustable brush. Install door manufacturer's multi-directional adjustable bottom with double nylon brush weatherstripping. Door bottom must be concealed and adjust to accommodate irregular tapered floor conditions.
- D. Concealed Adjustable Meeting Stile Astragal at Pairs of Doors. Install door manufacturer's adjustable astragal with double pile weather seal weatherstripping.
- E. Receive Hardware supplied in accordance with this Section, and coordinate with additional Hardware requirements of section 08 7100 - Door Hardware. Report discrepancies (in writing) to the Architect immediately.
- F. Reinforce, cut, drill and tap doors and frames as required to receive Hardware, except do not drill and tap for surface mounted closers and holders, which will be applied at the jobsite. Comply with Hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
- G. Install all Hardware, except surface mounted closers and holders, at the fabrication plant. Remove only Hardware as required for final finishing or delivery to jobsite. Package and identify such Hardware and ship with doors and frames for installation at the project site.
- H. Painting: All existing surfaces to remain exposed, and all disturbed areas shall be painted to match existing surfaces.

2.5 FABRICATION:

- A. Sizes and Profiles: The required sizes for door and frame units, and profiles requirements are shown on the drawings.
- B. The details shown are based upon standard details by one or more manufacturers. It is intended that similar details by other manufacturers will be accepted, provided they comply with size requirements, and with minimum/maximum profile requirements as shown.
- C. Co-ordination of Fabrication: Check the actual frame or door openings in the construction work by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress, as directed by Contractor, and avoid delays of the work.
- D. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to the cleaning, finishing, treatment and application for coatings. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1/64".

- E. No Welding of joints will be accepted.
- F. Conceal fasteners, wherever possible, except as otherwise noted.
- G. Maintain continuity of line and accurate relation of planes and angles. Provide secure attachments and support at mechanical joints, with hairline fit at contacting members.
- H. Reinforce the work as necessary for performance requirements, and for support to the structure. Separate dissimilar metals with bituminous paint or preformed separators which will prevent corrosion. Separate metal surfaces at moving joints with non-metallic separators to prevent "freeze-up" of joints.

2.6 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. Door Hardware: As specified in Section 08 7100.

2.7 FINISHES

- A. Class I Natural Finish or Anodized Plus Natural Anodized 2-step Finish:
 - 1. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.
 - a. Use for door trim and hardware.
- B. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions
 - 1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 50% polyvinylfluoride resin by weight; complying with AAMA 2604.
 - a. Use for aluminum frame components.

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. Do not begin installation until substrates have been properly prepared.

3.2 PREPARATION

- A. Remove existing doors and frames, and dispose of all removed materials in accordance with local authorities having jurisdiction.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- 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. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

- D. Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate Aluminum, and other corrodible metal surfaces, from sources of corrosion or electrolytic action at points of contact with other materials, with bituminous coatings, or other means as approved by Architect.
- E. Set saddles in a bed of compound.
- F. Separate aluminum and other metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- G. Repair or replace damaged installed products.

3.4 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.

3.5 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.

3.6 PROTECTION

- A. Protect installed products from damage during subsequent work.
- B. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.
- C. 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 7100
DOOR HARDWARE**

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. Work of this Section includes all labor, materials, equipment and services necessary to furnish all the finish hardware as shown on the drawings and specified herein, including but not limited to the following:
 - 1. Hardware for aluminum doors.
 - 2. Weatherstripping, seals and door gaskets.
- B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:
 - 1. Toilet accessories

1.3 RELATED REQUIREMENTS

- A. Section 08 1613 - Fiberglass Doors and Aluminum Frames.

1.4 REFERENCE STANDARDS

- A. American National Standards Institute - ANSI 156.18 - Materials and Finishes.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- D. BHMA - Builders Hardware Manufacturers Association.
- E. DHI - Door and Hardware Institute.
 - 1. Sequence and Format for the Hardware Schedule
 - 2. Recommended Locations for Builders Hardware
 - 3. Key Systems and Nomenclature
- F. New York State Building Code.
- G. NAAM - National Association of Architectural Metal Manufacturers.
- H. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2011.
- I. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks; 2014.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware will be installed upon.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Convey Warwick Valley Central School District's 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, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements, marked to clearly show products to be furnished for this project.
- C. Hardware submission: Submit hardware schedule in vertical format as illustrated by the "Sequence and Format for Hardware Schedule" pamphlet published by the Door and Hardware Institute. Schedules

which do not comply will be returned for correction before checking. Indicate complete designations of each item required for each door or opening, include:

1. Opening Lock Function Spreadsheet: List locking device and function for each opening.
 2. Type, style, function, size, and finish of each hardware item.
 3. Name and manufacturer of each item.
 4. Fastenings and other pertinent information.
 5. Location of each hardware set cross-referenced to indications on Drawings.
 6. Explanation of all abbreviations, symbols, and codes contained in schedule.
 7. Mounting locations for hardware.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- F. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation
- G. Keys: Deliver with identifying tags to Warwick Valley Central School District by security shipment direct from hardware supplier.
- H. Informational Submittals:
1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
 2. Product Certificates for electrified door hardware, signed by manufacturer:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
- I. Warranty: Special warranty specified in this Section
- J. Closeout Requirements: Section 01 7800 - Closeout Submittals
- K. Copy of warranties including appropriate reference numbers for manufacturers to identify project
- L. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Warwick Valley Central School District's name and registered with manufacturer.
- M. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

1.7 QUALITY ASSURANCE

- A. Hardware: shall be suitable and adapted for its required use and shall fit its designated location. Should any hardware as shown, specified or required fail to meet the intended requirements or require modification to suit or fit the designated location, determine the correction or modification necessary and notify the Architect in ample time to avoid delay in the manufacture and delivery of hardware.
- B. Product Substitutions: Comply with product requirements stated in Section 01 2500 - Substitution Procedures and as specified herein.
1. Where products indicate "acceptable manufacturers" or "acceptable manufacturers and products", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years of documented experience.
- D. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project
- E. Single Source Responsibility: Obtain each type of door hardware from a single manufacturer.
- F. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

- G. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high [and] 3/4 inch (19 mm) high for exterior sliding doors].
 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

1.8 KEY SCHEDULE

- A. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.

1.9 PROJECT CONDITIONS

- A. Field Service: The hardware supplier shall assign a competent representative, acceptable to the Architect, to be at the job site each time a major shipment of finish hardware is received. Such representative shall assist in "checking in" these shipments and shall secure a receipt covering the contents of each shipment. In addition, such representative shall be available for immediate call to the job site when, in the opinion of the Architect, his presence is necessary.
- B. Templates: Promptly following approval of the Hardware Schedule by the Architect, furnish and deliver template information, to the fabricators, of items to which finish hardware is to be applied.
1. Such deliveries shall be made in ample time to avoid delays in such work of said fabricators. Provide drawings, schedules and detailed information to other trades as necessary for them to accommodate and prepare their work to receive the finish hardware.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
- B. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- C. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
1. Each article of hardware shall be individually packaged in manufacturer's original packaging.
 2. Deliver each article of hardware in manufacturer's original packaging
- D. Protection and Damage:
1. Promptly replace products damaged during shipping with exactly the same products.
 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during the course of the Work.
 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- F. Deliver keys to Owner by registered mail or overnight package service

1.11 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Direct shipments not permitted, unless approved by the Owner.

1.12 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Years from date of Substantial Completion, for durations indicated.
 - a. Closers:
 - a) Mechanical: 30 years.
 - b. Locksets:
 - a) Mechanical: 3 years.
 - c. Continuous Hinges: Lifetime warranty
 - d. Key Blanks: Lifetime
 - 2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.13 MAINTENANCE

- A. Maintenance Tools:
 - 1. Furnish One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Allegion Brands; Ives, LCN, or Schlage: www.allegion.com/us.
- B. Assa Abloy Brands; Corbin Russwin, Curries, McKinney, Norton, Sargent, or Yale: www.assaabloydss.com/#sle.
- C. Substitutions: See Section 01 6000 - Product Requirements.

2.2 MANUFACTURERS - BASIS OF DESIGN

- A. Provide hardware as indicated in hardware sets. Products other than those listed in the sets may be considered, provided that they are proven to be of equal quality and have equal performance to those products specified. See product description for each type of product for details on performance and quality requirements. The architect reserves the right to review and approve all proposed equivalents.
- B. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval

2.3 DOOR HARDWARE - GENERAL

- A. Provide hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

- B. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware are indicated herein. Products are identified by using appropriate hardware designation numbers.
- C. Provide items of a single type of the same model by the same manufacturer.
- D. Provide products that comply with the following:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Accessibility: ADA Standards and ICC A117.1.
 - 3. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
 - 4. Applicable provisions of NFPA 101, Life Safety Code.
 - 5. Fire-Rated Doors: NFPA 80.
 - 6. Hardware on Fire-Rated Doors, Except Hinges: Listed and classified by UL as suitable for the purpose specified and indicated.
 - 7. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.
- E. Function: Lock and latch function numbers and descriptions of manufactures series as listed in hardware schedule.
- F. Finishes: Identified in schedule.
- G. Fasteners:
 - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 - 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 - 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
 - 4. Install hardware with fasteners provided by hardware manufacturer.
- H. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.4 LOCKS AND LATCHES

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
 - 1. Hardware Sets indicate locking functions required for each door.
 - 2. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
 - 3. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- B. Lock Cylinders: Manufacturer's standard tumbler type, seven-pin interchangeable core.
 - 1. Provide cams and/or tailpieces as required for locking devices required.
- C. Keying: Match District Master key system..
 - 1. Include construction keying.
 - 2. Key to existing keying system.

2.5 HINGES

- A. Continuous Hinges:
 - 1. For interior or exterior doors up to 450lbs, and 4'-0" wide.
 - 2. To be constructed of extruded aluminum 6063-T6 alloy with thermoplastic polyester bearings.
 - 3. Shall meet ANSI/BHMA A156.25.
 - 4. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
 - 5. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
 - 6. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
 - 7. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
 - 8. Install hinges with fasteners supplied by manufacturer.
 - 9. Provide hinges with symmetrical hole pattern
 - 10. Filler Plates: Coordinate size and weight of existing hinge preparation. Furnish and install filler plates prior to the installation of the new continuous hinge.
- B. Manufacturers - Hinges:
 - 1. Continuous Hinges: Ives 112HD , as specified in hardware sets.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.6 PUSH/PULLS

- A. Push/Pulls: Comply with BHMA A156.6.
 - 1. Provide push on doors were specified.
- B. Manufacturers - Push/Pulls:
 - 1. Assa Abloy Brands; McKinney: www.assaabloydss.com/#sle.

2.7 CYLINDRICAL LOCKSETS

- A. Cylindrical Locksets - Basis of Design: Schlage ND Series.
- B. Locking Functions: As defined in BHMA A156.2, and as follows:
 - 1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1. Cylinders: Refer to "KEYING" article, herein.
 - 2. Provide locksets able to withstand 1500 inch pounds of torque applied to locked outside lever without gaining access per ANSI/BHMA A156.2 Abusive Locked Lever Torque Test and cycle tested to 3 million cycles per ANSI/BHMA A156.2 Cycle Test.
 - 3. Provide solid steel rotational stops to control excessive rotation of lever.
 - 4. Provide completely refunctionable lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
 - 5. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
 - 6. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
 - 7. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
 - 8. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
 - 9. Provide electrified options as scheduled in the hardware sets.
 - 10. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
 - a. Lever Design: Schlage Tubular.
 - 11. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous

2.8 AUXILIARY LOCKS (DEADBOLTS)

- A. Locking Functions: As defined in BHMA A156.5, and as follows:
 - 1. Deadbolt, Classroom: E017.

2.9 CYLINDERS

- A. Requirements:
 - 1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
 - 2. Nickel silver bottom pins.
 - 3. Replaceable Construction Cores.
 - a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - a) 12 construction change (day) keys.
 - 4. Owner or Owner's Representative will replace temporary construction cores with permanent cores

2.10 CLOSERS

- A. Closers: Complying with BHMA A156.4 Grade 1 Certified. All closers shall have certification by BHMA certified independent testing laboratory of 10,000,000 cycles without failure.
 - 1. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
 - 2. Cylinder Body: 1-1/2 inch (38 mm) diameter, with 5/8 inch (16 mm) diameter double heat-treated pinion journal.
 - 3. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
 - 4. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
 - 5. Hydraulic Regulation: By tamper-proof, non-critical valves with separate adjustment for latch speed, general speed, and backcheck.
 - 6. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
 - 7. Pressure Relief Valve (PRV) Technology: Not permitted.
 - 8. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
 - 9. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
 - 10. Provide surface-mounted, door-mounted closers unless otherwise indicated.
 - 11. Provide a door closer on every exterior door.
 - 12. Provide a door closer on every fire- and smoke-rated door. Spring hinges are not an acceptable self-closing device unless specifically so indicated.
 - 13. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.
 - 14. At corridors, locate door-mounted closer on room side of door.
 - 15. At outswinging exterior doors, mount closer in inside of door.
 - 16. All closers shall have, forged steel arms, and separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power.
 - 17. Closers shall be furnished with parallel arms mounting on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit.

18. Provide sex bolts at all wood doors.
 19. Closers shall be barrier free with spring tension adjustable from size 1 to size 5. Provide reduced closing force and delayed action.
 20. All Closers shall incorporate multi point hold open with by pass feature from 0- 140 degrees..
 21. Closers shall maintain control of the door in all conditions. Closers shall have 3 non critical adjusting valves: latch, main and backcheck. Backcheck shall take affect at 45 (AVB) degrees of opening for parallel arm closers and 70 degrees for regular arm closers. Closers with pressure relief valves are not acceptable
 22. All closers shall have forged main arms. Forearms of parallel arm closers shall be forged. Parallel arm brackets shall be forged. All parallel arm joints shall have bronze bushings with minimum 5/8" diameter pins. Cylinders, arms, brackets and mounting plates shall be powder coated.
 23. Provide all plates, brackets and special templates when needed for interface with particular header, door and wall conditions and neighboring hardware. Consult factory for special template ("ST" suffix to closer number) pricing.
 24. All closers shall be installed so that closer bodies are positioned on room side of doors to and from corridors. Out-swing doors shall have an extra heavy duty parallel arm (EDA). Parallel arm shall be used on connecting doors between rooms.
 25. All exterior closers shall have all weather fluid that does not require seasonal adjustment to control speed of door, and shall exhibit the same viscosity from -30 ° F to +120° F.
 26. Provide metal covers for all Closers.
 - a. All metal shall be provided with powder coat to match door trim.
 27. Provide manufacturer's 10 year warranty
- B. Manufacturers - Surface Mounted Closers:
1. LCN 4010/4110/4020 series; an Allegion brand: www.allegion.com/us.
 2. Substitutions: See Section 01 6000 - Product Requirements.

2.11 STOPS AND HOLDERS

- A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
1. Provide wall stops, unless otherwise indicated.
 2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
- B. Wall Stops: WS407CCV/CVX series..
- C. Manufacturers - Wall and Floor Stops/Holders:
1. Assa Abloy Brands; McKinney: www.assaabloydss.com/#sle.
 2. .

2.12 GASKETING AND THRESHOLDS

- A. Gaskets: Complying with BHMA A156.22.
1. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.
 2. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
 - a. Where exterior door is also required to have fire or smoke rating, provide gaskets functioning as both smoke and weather seals.
 3. On each exterior door, provide door bottom sweep, unless otherwise indicated.
 4. Door sweeps: shall be extruded aluminum and black neoprene sweep.
 - a. Fasten door sweeps with wood screws for wood doors and sheet metal screws for hollow metal and fiberglass reinforced doors.

- b. Door sweep shall be 1 ¼" in overall height with a ½" high neoprene sweep.
 - c. Mount door sweep on the exterior side of the door, with the neoprene engaged with the threshold or finish floor.
- B. Thresholds: Complying with BHMA A156.21.
 - 1. At each exterior door, provide a threshold unless otherwise indicated.
 - 2. Field cut threshold to frame for tight fit, including around removable mullions..
 - 3. Provide threshold units not less than 4" wide, formed to accommodate change in floor elevation.
 - 4. Thresholds shall extend a minimum of 1" past the exterior face of the door, and have returned closed ends
 - 5. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
 - 6. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
 - 7. All threshold units shall comply with the Americans with Disabilities Act (ADA). They shall not exceed ¼" in height with a wall thickness of .125" unless specified otherwise. Coordinate templates for any and all hardware.
 - a. Set all thresholds in grout, and seal with silicone caulk.
 - b. Furnish threshold with non-slip epoxy abrasive bonded within the grooves of the threshold
- C. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available
- D. Fasteners At Exterior Locations: Non-corroding.
- E. Manufacturers - Gasketing and Thresholds:
 - 1. Zero International, Inc; ____: www.zerointernational.com/#sle.

2.13 PROTECTION PLATES AND ARCHITECTURAL TRIM

- A. Protection Plates:
 - 1. Kickplate: Provide on push side of every door with closer, except aluminum storefront and glass entry doors.
 - 2. Kickplates shall be .050 gauges, 8" high and two (2) inches less full width of door, 1 inch (25 mm) less width of door on pairs or as specified. Push plates, pull plates, door pulls and miscellaneous door trim shall be as shown in the hardware schedule.
 - 3. Manufacturer:
 - a. Ives
 - b. Burns, Trimco
- B. Screws: All exposed screws shall be Phillips head.

2.14 FINISHES

ANSI	US	FINISHES	BASIC METAL
626	US26D	SATIN CHROMIUM	BRASS, BRONZE
628	US28	SATIN ALUMINUM CLEAR ANODIZED	ALUMINUM
630	US32D	SATIN STAINLESS STEEL	STAINLESS STEEL 304
689	US28	ALUMINUM PAINTED	ANY COLOR
AL	US28	ALUMINUM MILL FINISH	ALUMINUM
DKB	USB10	DARK BRONZE	ANY METAL
GRY		GREY	RUBBER

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.
- C. Ensure that walls and frames are square and plumb before hardware installation.
- D. The installer shall notify the architect, in writing, of all unacceptable condition that could affect the proper operation of the finish hardware.
- E. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

3.2 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Mounting heights for hardware from finished floor to center line of hardware item: shall conform to ADA requirements unless indicated otherwise.
 - 1. Standard Metal Doors and Frames: ANSI/SDI A250.8.
- D. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.
- E. Unless otherwise specified, locate all hardware in accordance with the recommended locations for builders hardware for standard doors and frames as published by the Door and Hardware Institute.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Frame set into new or existing masonry wall and filled with mortar, drill and tap fasteners.
- H. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
- I. Unless otherwise specified or detailed, install thresholds with the bevel in vertical alignment with the outside door face. Notch and closely fit thresholds to frame profile. Set thresholds in full bed of sealant.
- J. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
- K. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- L. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- M. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying section.
- N. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
 - 1. Adjust spring power of door closers to insure exterior and fire rated doors will consistently close and latch doors under existing conditions. Adjust all other door closers to insure opening force does not to exceed 5 lbs.

- 2. Adjust "sweep", "latch", & "back check" valves on all door closers to properly control door throughout the opening and closing cycle. Adjust total closing speed as required to comply with all applicable state and local building codes
- O. Set exterior door thresholds with full-width bead of elastomeric sealant on each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.
- P. Stops: Provide wall stops for doors unless floor or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- Q. Locate floor stops not more than 4 inches from the wall.
- R. Locate floor stops not more than 4 inches from the wall.
- S. Shim doors as required to maintain proper operating clearance between door and frame.
- T. Use only fasteners supplied by or approved by the manufacturer for each respective item of hardware.
- U. Where necessary, adjust doors and hardware as required to eliminate binding between strike and latchbolt. Doors should not rattle.
- V. Deliver to the owner 1 complete set of installation and adjustment instructions, and tools as furnished with the hardware.

3.3 FIELD QUALITY CONTROL

- A. After installation has been completed, inspected and report issued the hardware supplier and manufacturers representative shall meet with the owner to explain the functions, uses, adjustment, and maintenance of each item of hardware.

3.4 ADJUSTING

- A. Adjust work under provisions of Section 01 7000.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.
- D. All hardware shall be left clean and in good operation. Hardware found to be disfigured, defective, or inoperative shall be repaired or replaced.

3.5 CLEANING

- A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. 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.
- B. Do not permit adjacent work to damage hardware or finish.

3.7 FINISHES

- A. Finish: BHMA 626/652 (US26D); except:
 - 1. Continuous Hinges: BHMA 628 (US28)
 - 2. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
 - 3. Protection Plates: BHMA 630 (US32D)
 - 4. Overhead Stops and Holders: BHMA 630 (US32D)
 - 5. Door Closers: Powder Coat to Match
 - 6. Wall Stops: BHMA 630 (US32D)
 - 7. Latch Protectors: BHMA 630 (US32D)
 - 8. Weatherstripping: Clear Anodized Aluminum
 - 9. Thresholds: Mill Finish Aluminum

ALL LOCK SETS: SHALL BE OPENABLE AT ALL TIMES FROM THE INSIDE (OCCUPIED SIDE) WITHOUT THE USE OF A KEY OR ANY SPECIAL KNOWLEDGE OR EFFORT.

HARDWARE SETS

HARDWARE GROUP NO. 01

PROVIDE TOILET ENTRANCE DOOR(S) WITH THE FOLLOWING:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1 EA	CONT. HINGE	112HD	628	IVE
1 EA	CLASSROOM DEADBOLT B763P		626	SCH
1 EA	PUSH PLATE 8400 4"X16" B-CS		630	IVE
1 EA	FSIC CORE	23-030 CKC EV29 T	626	SCH
1 EA	SURFACE CLOSER	4010T	689	LCN
1 EA	KICK PLATE 8400 12" X 2" LDW B-CS		630	IVE
1 EA	THRESHOLD	656A-MSLA-10	A	ZER
1 EA	DOOR PULL	BY DOOR MANUFACTURER		
1 SET	WEATHERSTRIPPING	BY DOOR MANUFACTURER		

HARDWARE GROUP NO. 02

PROVIDE MECHANICAL ROOM WITH THE FOLLOWING:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1 EA	CONT. HINGE	112HD	628	IVE
1 EA	STOREROOM LOCK	ND80TD TLR	626	SCH
1 EA	FSIC CORE	23-030 CKC EV29 T	626	SCH
1 EA	SURFACE CLOSER	4010T -3038HB	689	LCN
1 EA	MOP PLATE	8400 12" X 1" LDW B-CS	630	IVE
1 EA	KICK PLATE	8400 12" X 2" LDW B-CS	630	IVE
1 EA	FLOOR STOP	FS436	626	IVE
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE SETS

31.1 All Lock Sets: Shall be Openable at all times from the inside (occupied side) without the use of a key or any special knowledge or effort.

- A. The following hardware schedule is furnished for whatever assistance it may afford the contractor and their subcontractor and is not intended to be entirely inclusive. Should any particular door or item be omitted in and hardware set heading the contractor shall provide such door or item.

END OF SECTION

SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Louvers, frames, and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 23 3100 - HVAC Ducts: Ductwork attachment to louvers.

1.3 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- 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.

1.4 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. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

1.6 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 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 25 psf (1.2 kPa) 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 bird screens at all louvers.
- B. Stationary Louvers: Horizontal blade, extruded aluminum construction.
 - 1. Free Area: 50 percent, minimum.
 - 2. Blades: Drainable.

3. Frame: 4 inches (100 mm) deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
4. Aluminum Thickness: Frame 12 gauge, 0.0808 inch (2.05 mm) minimum; blades 12 gauge, 0.0808 inch (2.05 mm) minimum.
5. Aluminum Finish: High performance organic coatings; finish welded units after fabrication.

2.2 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M). 6063T6 alloy and temper.

2.3 FINISHES

- A. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system.
- B. Color: As selected from manufacturer's standard colors.

2.4 ACCESSORIES

- A. Blank-Off Panels: Aluminum face and back sheets, polyisocyanurate foam core, 1-1/2 inch (38 mm) thick, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.
- B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- C. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch (1.63 mm) diameter wire, 1/2 inch (13 mm) open weave, diagonal design.
- D. Fasteners and Anchors: Stainless steel.
- E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

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. Install louvers level and plumb.
- C. Set sill members and sill flashing in continuous bead of sealant.
- D. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- E. Secure louver frames in openings with concealed fasteners.
- F. 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 SECTION INCLUDES

- A. Metal stud and channel ceiling and soffit framing.
- B. Gypsum wallboard.
- C. Joint treatment and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

1.3 REFERENCE STANDARDS

- A. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- E. 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.
- F. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- G. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- H. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- I. GA-216 - Application and Finishing of Gypsum Board; 2013.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

PART 2 PRODUCTS

2.1 METAL FRAMING MATERIALS

- A. Non-Loadbearing 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/120 at 5 psf (L/120 at 240 Pa).
 - 1. Studs: "C" shaped with flat or formed webs with knurled faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Thickness: 20ga.
 - 4. Ceiling Channels: C-shaped.
 - 5. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
- B. Non-structural Framing Accessories:
 - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

2.2 BOARD MATERIALS

- A. 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 and ceilings, unless otherwise indicated.
 - 2. 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.
- B. Abuse Resistant Wallboard:
 - 1. Application: All locations.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. Type: Fire resistance rated Type X, UL or WH listed.
 - 4. Thickness: 5/8 inch (16 mm).
 - 5. Edges: Tapered.
 - 6. Paper-Faced Products:
 - a. American Gypsum Company; M-Bloc AR Type X.
 - b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold Guard Abuse-Resistant.
 - c. National Gypsum Company; Gold Bond Hi-Abuse XP Gypsum Board.

2.3 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed mineral fiber, friction fit type, unfaced. Thickness: 4 inch (101.6 mm).
 - 1. Mineral fiber blanket thermal insulation: Type 1; ASTM C665
 - 2. Flame Spread and Smoke Developed Index: 0; ASTM E84
 - 3. Density: 2.2 lbs/cu.ft.; ASTM C167
 - 4. Product: Rockwool AFB, or approved equal.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 - 1. Rigid Corner Beads: Low profile, for 90 degree outside corners.
 - 2. L-Trim with Tear-Away Strip: Sized to fit 5/8 inch (20 mm) thick gypsum wallboard.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 2. Ready-mixed vinyl-based joint compound.
 - 3. Chemical hardening type compound.
- E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion resistant.

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. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

1. Level ceiling system to a tolerance of 1/1200.
- C. Studs: Space studs at 16 inches on center (at 406 mm on center).
 1. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

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 Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. 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 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 2. Level 1: Wall and soffit 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 (0.8 mm).

END OF SECTION

**SECTION 09 3000
TILING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tile for wall applications.
- B. Non-ceramic trim.

1.2 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- B. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.3 REFERENCE STANDARDS

- A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2013.1.
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.
- C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).
- E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).
- F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- G. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
- H. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2010 (Revised).
- I. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2013.1.
- J. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, 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 (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.
- D. Maintenance Materials: Furnish the following for Warwick Valley Central School District's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 10 square feet (1 square meters) of each size, color, and surface finish combination.

1.5 QUALITY ASSURANCE

- A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

- C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.7 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.

PART 2 PRODUCTS

2.1 TILE

- A. Porcelain Tile: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: 12 by 24 inch (305 by 610 mm), nominal.
 3. Thickness: 3/8 inch (9.5 mm).
 4. Edges: Cushioned.
 5. Surface Finish: Matte glazed.
 6. Color(s): To match existing adjacent wall tile.

2.2 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
1. Applications:
 - a. Open edges of wall tile.
 - b. Wall corners, outside and inside.
 2. Manufacturers:
 - a. Schluter-Systems: www.schluter.com/#sle.

2.3 SETTING MATERIALS

- A. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
 2. Products:
 - a. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com/#sle.

2.4 GROUTS

- A. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch (3.2 mm) wide and larger; use unsanded grout for joints less than 1/8 inch (3.2 mm) wide.
 3. Color(s): As selected by Engineer from manufacturer's full line.
 4. Products:
 - a. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- 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 tile.

- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI 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 wall 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 non-ceramic trim in accordance with manufacturer's instructions.
- F. Sound tile after setting. Replace hollow sounding units.
- G. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- H. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- I. 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.

3.4 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244.
- B. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

3.5 CLEANING

- A. Clean tile and grout surfaces.

END OF SECTION

SECTION 09 5100
SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.2 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.
- C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.
- D. UL (FRD) - Fire Resistance Directory; current edition.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

1.4 SUBMITTALS

- A. Product Data: Provide data on suspension system components and acoustical units.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

- A. Acoustical Panels: Painted mineral fiber, with the following characteristics:
 - 1. Application(s): All areas except Main Lobby.
 - 2. Classification: ASTM E1264 Type III.
 - a. Form: 2, water felted.
 - b. Pattern: "E" - lightly textured.
 - 3. Size: 24 by 24 inches (610 by 610 mm) .
 - 4. Thickness: 7/8 inches (22 mm).
 - 5. NRC Range: 0.75 to 0.78, determined in accordance with ASTM E1264.
 - 6. Panel Edge: Reveal.
 - 7. Color: White.
 - 8. Suspension System: Exposed grid.
 - 9. Products:
 - a. Armstrong World Industries, Inc; Cirrus High NRC: www.armstrongceilings.com/#sle.
- B. Acoustical Panels: Glass fiber with membrane-faced overlay, with the following characteristics:
 - 1. Application(s): Main Lobby Upper Ceiling.
 - 2. Classification: ASTM E1264 Type XII.
 - a. Form: 1, plastic.
 - b. Pattern: "E" - lightly textured.
 - 3. Size: 24 by 24 inches (610 by 610 mm).
 - 4. Thickness: 1 1/2 inches (37 mm).
 - 5. NRC Range: 1.00 to 1.05, determined in accordance with ASTM E1264.
 - 6. Panel Edge: Reveal.

7. Color: White.
8. Suspension System: Exposed.
9. Products:
 - a. Symphony F; Certainteed .

2.2 SUSPENSION SYSTEM(S)

- A. Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with clips, splices, and perimeter moldings as required.
 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dipped galvanized steel grid with cap.
 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 2. Profile: Tee; 15/16 inch (24 mm) face width.
 3. Finish: Baked enamel.
 4. Color: White.
 5. Products:
 - a. Match existing components.

2.3 ACCESSORIES

- A. Hanger Wire: 12-gage 0.08 inch (2 mm) galvanized steel wire.
- B. Perimeter Moldings: Same material and finish as grid.
 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

PART 3 EXECUTION

3.1 Preparation

- A. Remove any loose, damaged or unsecure components of original installation back to splice point or cross joint.
- B. Install after major above-ceiling work is complete.
- C. Coordinate the location of hangers with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

- A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- B. Extend existing system layout. Secure new componenets to existing grid.
- C. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- D. Do not eccentrically load system or induce rotation of runners.
- E. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 1. Use longest practical lengths.

3.3 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 units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

- F. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.

3.4 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6725
URETHANE RESIN 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 SUMMARY

- A. This Section includes the following:
 - 1. Decorative monolithic urethane - resinous flooring system, one with Urethane base mortar, urethane binder, broadcast aggregates and urethane sealer.
 - 2. Integral cove base.

1.3 RELATED WORK

- A. Concrete - Section 03 3000 - Cast-in-Place Concrete.
- B. Refer to Division 22 for floor drains, clean-outs etc.

1.4 SUBMITTALS

- A. Product Data: For each type of product specified. Include manufacturer's technical data, installation instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors, textures, and patterns available for each resinous flooring system indicated.
- C. Installer Certificates: Signed by manufacturer certifying that installer complied with specified requirements.
- D. Material certificates signed by manufacturer certifying that the flooring submitted complies with requirements specified herein.
- E. Maintenance Data: Provide maintenance data to be included in the maintenance manuals.

1.5 PROPERTIES

- A. See Resin Flooring Schedule at the end of Part 3.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer (applicator) with a minimum of five (5) years of documented experience and who has specialized in installing resinous flooring similar in material, design, and extent to that indicated for this Project and who is acceptable and is certified, in writing, to resinous flooring manufacturer.
 - 1. Installer shall have completed at least 10 projects of similar size and complexity.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, and sealing or finish coats, through one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- C. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall provide a Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.
 - 1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.
 - 2. Field Technical Services Representatives shall provide written reports on inspection of substrate, mockup and final inspection.

- D. Field Mock-Up: On floor area selected by Architect, provide full-thickness resinous flooring system samples that are at least 48 inches square to demonstrate texture, color, thickness, chemical resistance, cleanability, and other features of each resinous flooring system required. Simulate finished lighting conditions for review of in-place field samples.
 - 1. If field samples are unacceptable, make adjustments to comply with requirements and apply additional samples until field samples are approved.
 - 2. After field samples are approved, these surfaces will be used to evaluate resinous flooring.
 - 3. Obtain Owner's Representative's approval of field samples before applying resinous flooring.
 - 4. Final approval of colors will be from field samples, not samples submitted for verification.
- E. Pre-installation Conference:
 - 1. General Contractor shall arrange a meeting not less than thirty days prior to starting work.
 - 2. Attendance:
 - a. General Contractor
 - b. Owner and Owner's Representative.
 - c. Manufacturer/Installer's Representative.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.
- C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation.
- B. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

1.9 WARRANTY

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (2) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (2) full year from date of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include are limited to, those indicated in the Resinous Flooring Schedule at the end of Part 3.
 - 1. Substitutions: See Section 01 2500 - Substitution Procedures
- B. System Characteristics:
 - 1. Color and Pattern: Choose from Mfg. Standards
 - 2. Wearing Surface: medium.
 - 3. Integral Cove Base: 6 inches.
 - 4. Overall System Thickness: nominal 1/8".

2.2 MATERIALS

- A. Resinous Flooring: Resinous floor surfacing system consisting of primer; body coat(s) including resin, hardener, aggregates, and colorants, if any; and sealing or finish coat(s). Comply with requirements indicated in the Resinous Flooring Schedule.
 - 1. Reinforcing Membrane: Manufacturer's flexible resin recommended for crack isolation to help prevent substrate cracks from reflecting through resinous flooring.
- B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- C. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.
- D. Waterproofing Membrane: Type recommended or produced by manufacturer of epoxy resin composition flooring system for type of service and floor condition indicated.
- E. Moisture Mitigation: 100% solids epoxy moisture management system.
 - 1. Product: Ardex MC Moisture Mitigation.
 - 2. If required cost for mitigation contract will be adjusted by allowance as described in the Agreement.
- F. Anti Microbial Additive: Incorporate antimicrobial chemical additive to control growth of most algae, bacteria, fungi, mildew and mold.
- G. Moisture Mitigation System: Concrete, especially slab on grade shall be tested in accordance with ASTM F1869. If pounds exceed flooring limit remedial action must be taken.
 - 1. ASTM F-2170 Test Method for Determining Relative Humidity in Concrete: Maximum RH: 75% shall be perform.

2.3 ACCESSORY MATERIALS

- A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.
- C. Waterproof membrane, required on floors above grade, 25 mil waterproof membrane or where various substrate material is present. Provide product recommended and approved by resinous flooring manufacturer for application indicated.
- D. Pitch materials required for all areas that require positive pitch to drains.
- E. Cove Base: Application of troweled cove base. No broadcast, to match floor color.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where decorative quartz epoxy flooring is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Owner's Representative.

3.2 PREPARATION

- A. Concrete Substrates: Provide sound surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, existing floor finish and other contaminants incompatible with resinous flooring.
 - 1. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
 - 2. Repair and flash patched damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations and do a level of acceptance by the manufacturer.

- B. Verify that concrete substrates are dry.
 - 1. Perform site probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 75 percent.
 - 2. Perform an hydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 5 lb of water/1000 sq. ft. of slab in 24 hours.
 - 3. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- E. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

3.3 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate and optimum interact adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
- B. Apply epoxy primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, of cove base. Round internal and external corners.
- D. Apply metal trowel single mortar coat in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, sand to remove trowel marks and roughness.
- E. Undercoat: Remove any surface irregularities by lightly abrading and vacuuming the floor surface. Mix and apply undercoat with strict adherence to manufacturer's installation procedures and coverage rates. Broadcast aggregate into wet material to point of refusal.
- F. Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer

3.4 TERMINATIONS

- A. Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.
- B. Penetration Treatment: Lap and seal resinous system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.
- C. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.5 JOINTS AND CRACKS

- A. Treat control joints to bridge potential cracks and to maintain monolithic protection.
- B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

3.6 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may at any time and any number of times during flooring application require material samples for testing for compliance with requirements.
 - 1. Owner's Representative will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified and sealed, and certified in presence of Contractor.
 - 2. If test results show installed materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.
- B. Refer to paragraph 1.6 Quality Assurance for Field Technical Services Representative's inspection reports.

3.7 CURING, CLEANING AND PROTECTING

- A. Cure decorative quartz epoxy flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.
- B. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.
- C. Clean resinous flooring not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each Project area. Use cleaning materials and procedures recommended in writing by resinous flooring manufacturer.

3.8 RESINOUS FLOORING SCHEDULE

3.9 Epoxy Resinous Flooring : Provide resinous flooring system complying with the following:

- A. Products: Provide the following, or approved equal:
 - 1. Sherwin Williams Resuflor Deco Quartz BC23,
- B. Substitutions: 01 25 00 - Substitution Procedures.
- C. Color and Pattern: As selected by Architect from manufacturer's full range of colors and patterns produced for resinous flooring complying with requirements indicated.
- D. System Thickness: 1/8 inch.
 - 1. Primer Coat.
 - 2. Slurry broadcast
 - 3. Bonding coat 2nd Broadcast
 - 4. Grout Coat
 - 5. Top Coat
- E. Wearing Surface: Anti slip
- F. Base: Integral cove base as indicated on plans.
- G. Components: Provide manufacturer's standard components complying with requirements, unless otherwise indicated. Provide the following additional components:
 - 1. Epoxy Primer.
 - 2. Reinforcing membrane if required over existing surface cracks.
 - 3. Body Coat.
 - 4. Chemical-resistant sealing or finish coat(s)
- H. Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to standard test methods indicated:
 - 1. Compressive Strength: 12,000 psi per ASTM C 579

2. Hardness: 70/65 Shore D @ 24 hrs as per ASTM D2240
3. Tensile Strength: 2,500 psi per ASTM C 307
4. Impact Resistance: Withstands 16 ft-lbs with no chipping, cracking, or delamination and not more than 0.011" permanent indentation per MIL-D-3134.
5. Abrasion Resistance: ASTM D 4060 (CS-17 wheel) 1000 cycles. Max. 90-100 mgs. loss.
6. Flammability: Self-extinguishing per ASTM D 635

END OF SECTION

**SECTION 09 9000
PAINTING AND COATING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Interior painting and coating systems.
- C. Exterior painting and coating systems.
- D. Scope:
 - 1. Finish surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - a. Exterior:
 - a) Concrete: Cementitious siding, Flexboard, Transite, non-roof shingles, common brick, stucco, tilt-up concrete, precast, and cast-in-place concrete.
 - b) Metal, Exposed surfaces of steel lintels.
 - c) Fiber-Cement: Siding, trim, and hardboard-bare/primed.
 - b. Interior:
 - a) Concrete Masonry Units
 - b) Metal: Structural steel columns, joists, trusses, beams, miscellaneous and ornamental iron, structural iron, and other ferrous metal.
 - c) Wood: Trim.
 - d) Drywall: Walls, ceilings, gypsum board, and similar items.
 - e) Concrete: Floors, mechanical equipment space.

1.2 RELATED REQUIREMENTS

- A. Section 07 1900 - Water Repellents.

1.3 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. SSPC-SP 13 - Surface Preparation of Concrete; (Reaffirmed 2015); 2003.

1.4 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Product characteristics.
 - 2. Surface preparation instructions and recommendations.
 - 3. Primer requirements and finish specification.
 - 4. Storage and handling requirements and recommendations.
 - 5. Application methods.
 - 6. Clean-up information.

PART 2 PRODUCTS

2.1 PAINTINGS AND COATINGS

- A. General:
 - 1. Provide factory-mixed coatings unless otherwise indicated.
 - 2. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:

- a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
- C. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

2.2 Paint Systems - EXTERIOR

- A. Concrete: Cementitious siding, board and trim.
 - 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - a) 1st Coat: Factory Primed or Sherwin-Williams Loxon Concrete and Masonry Primer Sealer LX02W50: www.sherwin-williams.com/#sle.
 - (a) 5.3 to 8 mils wet, 2.1 to 3.2 mils dry.
 - b) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Acrylic Semi-Gloss, B66-650 Series: www.sherwin-williams.com/#sle.
 - (a) 6 to 12 mils wet, 2 to 4 mils dry per coat.
- B. Metal, Miscellaneous: Iron, ornamental iron, structural iron and steel, ferrous metal.
 - 1. Alkyd Systems, Water-Based:
 - a. Semi-Gloss Finish:
 - a) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle.
 - b) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series: www.sherwin-williams.com/#sle.

2.3 Paint Systems - INTERIOR

- A. Masonry CMU: Concrete, smooth, high density.
 - 1. Epoxy Systems, Water-Based:
 - a. Semi-Gloss Finish:
 - a) 1st Coat: Sherwin-Williams Loxon Block Surfacer, LX01W200: www.sherwin-williams.com/#sle.
 - (a) 50 to 100 sq ft/gal (1.2 to 2.5 sq m/L).
 - b) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46 Series: www.sherwin-williams.com/#sle.
 - (a) 4 mils wet, 1.5 mils dry per coat.
- B. Metal: Structural steel columns, joists, trusses, beams, miscellaneous and ornamental iron, structural iron, and ferrous metal.
 - 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - a) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle.
 - (a) 5 mils wet, 2 mils dry per coat.
 - b) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Acrylic Semi-Gloss, B66-650 Series: www.sherwin-williams.com/#sle.
 - (a) 2 to 4 mils dry per coat.
- C. Wood: Trim.
 - 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - a) 1st Coat: Sherwin-Williams Premium Wall and Wood Primer, B28W8111: www.sherwin-williams.com/#sle.

- b) 2nd and 3rd Coat: Sherwin-Williams ProClassic Waterborne Acrylic Semi-Gloss, B31 Series: www.sherwin-williams.com/#sle.
- D. Drywall: Walls, ceilings, gypsum board, and similar items.
 - 1. Latex Systems:
 - a. Eg-Shel Finish:
 - a) 1st Coat: Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600: www.sherwin-williams.com/#sle.
 - b) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 Zero VOC Eg-Shel, B20-2600 Series: www.sherwin-williams.com/#sle.
- E. Concrete: Floors, non-vehicular.
 - 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - a) 1st and 2nd Coat: Sherwin-Williams Tread-Plex Acrylic Floor Coating, B90 Series: www.sherwin-williams.com/#sle.
 - (a) 3.5 mils wet, 1.5 mils dry per coat.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. 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 mildew from impervious surfaces by scrubbing with solution of water and bleach. Rinse with clean water and allow surface to dry.
- D. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk.
 - 2. Prepare concrete according to SSPC-SP 13.
- E. Masonry: Remove efflorescence and chalk.
- F. Gypsum Board: Fill minor defects with filler compound; sand smooth and remove dust prior to painting.
- G. Ferrous Metal:
 - 1. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Prime bare steel surfaces.
- H. Wood and Fiber-Cement Trim: Remove dust, grit, and foreign matter. Scrape, sand, and spot prime knots and pitch streaks. Fill nail holes and imperfections with wood filler and sand smooth.

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. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness.

3.4 Priming

- A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
- B. All primers shall be tinted a different hue than final coats.
- C. Primers specified in painting schedules may be omitted on items factory primed or factory finished items if acceptable to top coat manufacturers.

3.5 Cleaning

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.6 PROTECTION

- A. Protect finished coatings from damage until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

**SECTION 10 1400
SIGNAGE**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Exterior room signs.

1.2 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; 2009.

1.3 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. Manufacturer's Qualification Statement.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.

PART 2 PRODUCTS

2.1 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 _____, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room Signs: Provide a sign in locations indicated.
 - 1. Sign Type: Flat signs with engraved panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille.
 - 3. Character Height: 1 inch (25 mm).
 - 4. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", and braille.

2.2 SIGN TYPES

- A. Flat Signs: Signage media without frame.
 - 1. Edges: Bevelled.
 - 2. Corners: Square.
 - 3. Wall Mounting of One-Sided Signs: Exposed Screws.
- B. Color and Font: Unless otherwise indicated:
 - 1. Character Font: Helvetica, Arial, or other sans serif font.
 - 2. Character Case: Upper case only.
 - 3. Background Color: To be selected from manufacturer's standards.
 - 4. Character Color: Contrasting color.

2.3 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
 - 1. Total Thickness: 1/16 inch (1.6 mm).

2.4 ACCESSORIES

- A. Exposed Screws: Stainless steel; tamper resistant

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. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2113.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Solid plastic toilet compartments.

1.2 RELATED REQUIREMENTS

- A. Section 10 2800 - Toilet Accessories.

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- D. Samples: Submit two samples of partition panels, 6 x 6 inch (150 x 150 mm) in size illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.1 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
 - 1. Doors:
 - a. Thickness: 1 inch (25 mm).
 - b. Width: 24 inch (610 mm).
 - c. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
 - d. Height: 55 inch (1397 mm).
 - 2. Panels:
 - a. Thickness: 1 inch (25 mm).
 - b. Height: 55 inch (1397 mm).
 - 3. Pilasters:
 - a. Thickness: 1 inch (25 mm).
 - b. Width: As required to fit space; minimum 3 inch (76 mm).

2.2 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches (76 mm) high; concealing floor fastenings.
- B. Head Rails: Extruded aluminum, anti-grip profile.
 - 1. Size: Manufacturer's standard size.
- C. Wall and Pilaster Brackets: Anodized aluminum; continuous type.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.

- E. Hinges: Anodized aluminum; satin finish.
 - 1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
- F. Door Hardware: Stainless steel, manufacturer's standard finish.
 - 1. Door Latch: Slide type with exterior emergency access feature.
 - 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
 - 3. Provide door pull for outswinging doors.
- G. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch (6 mm).
- B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.4 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

END OF SECTION

**SECTION 10 2800
TOILET ACCESSORIES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Baby changing stations.
- B. Custodial accessories.
- C. Feminine hygiene vendors and disposals.
- D. Grab bars.
- E. Hand dryers.
- F. Mirrors.
- G. Paper towel dispensers.
- H. Soap and hand sanitizer dispensers.
- I. Toilet tissue dispensers.

1.2 RELATED REQUIREMENTS

- A. Section 10 2113.19 - Plastic Toilet Compartments.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.
- D. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- F. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004 (Reapproved 2010).

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate work with the placement of reinforcement of toilet partitions to receive anchor attachments.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: American Specialties, Inc: www.americanspecialties.com
- B. Under-Lavatory Pipe Supply Covers: Tru-Bro, Inc.

2.2 Baby Changing Stations

- A. Baby Changing Station: Wall-mounted folding baby changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Polyethylene.
 - 2. Mounting: Surface.
 - 3. Minimum Rated Load: 250 lb (113.4 kg).
 - 4. Products:
 - a. Model 9014 - Baby Changing Station - Horizontal - Plastic - Surface-mounted.

2.3 Custodial Accessories

- A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.
 - 1. Drying rod: Stainless steel, 3/8 inch (9.5 mm) diameter.
 - 2. Hooks: 14 gauge, 0.078 inch (2.00 mm) thick stainless steel rag hooks at shelf front.
 - 3. Mop/broom Holders: Cadmium-plated steel spring-loaded rubber cam holders at shelf front.
 - 4. Length: Manufacturer's standard length for number of holders/hooks.
 - 5. Products:
 - a. Model 1308-3 - 4 Hooks, 3 Holders - Shelves/Utility Hook and Mop Strip - Surface-mounted.

2.4 Feminine Hygiene Vendors and Disposals

- A. Combination Sanitary Napkin/Tampon Dispenser: Stainless steel.
 - 1. Mounting: As indicated in product listing.
 - 2. Door: Seamless 18 gauge, 0.05 inch (1.3 mm) door with returned edges and tumbler lock.
 - 3. Cabinet: Fully welded, 22 gauge, 0.03 inch (0.8 mm) thick sheet.
 - 4. Operation: As indicated in product listing. Provide coin slots and locked coin box, separately keyed, where coin operation is indicated.
 - 5. Identify dispensers slots without using brand names.
 - 6. Capacity: As indicated in product listing.
 - 7. Products:
 - a. Model 0864-F - Free Operation - Sanitary Napkin (30) and Tampon (27) Dispenser - Surface-mounted.
- B. Sanitary Napkin Disposal Unit: Stainless steel, self-closing door, locking bottom panel with full-length heavy-duty stainless steel multi-staked piano hinge, removable receptacle.
 - 1. Mounting: As indicated in product listing.
 - 2. Cabinet and Door: Fully welded, 22 gauge, 0.03 inch (0.8 mm) thick sheet.
 - 3. Products:
 - a. Model 0472-1 - with Lock - Sanitary Napkin Disposal - Dual Access - Partition-mounted.
 - b. Model 0852 - Sanitary Napkin Disposal - Surface-mounted.

2.5 Grab Bars

- A. Grab Bars: Type 304 stainless steel.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 lbf (1112 N), minimum.
 - b. OD: 1 1/2 inch (32 mm).
 - c. Tubing Thickness: 18 gauge, 0.05 inch (1.3 mm).
 - d. Flange Mounting: Snap Flange Cover.
 - e. Flange Thickness: 11 gauge, 0.125 inch (3.2 mm)
 - f. Clearance: 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.

- g. Finish: Peened.
- h. Length and Configuration: As indicated on drawings.

2.6 Hand Dryers

- A. Electric Hand Dryers: Traditional fan-in-case type.
 - 1. Operation: Automatic, sensor-operated on and off.
 - 2. Mounting: Surface mounted.
 - 3. Nozzle Type: As indicated on Technical Data Sheet for selected ASI model.
 - 4. Cover: Stainless Steel.
 - a. Tamper-resistant screw attachment of cover to mounting plate.
 - 5. Supply Voltage: As indicated on drawings.
 - 6. Warranty: 3 years.
 - 7. Drying Time: Less than 15 seconds.
 - 8. Sound Pressure: 68-74 dB(A) measured at 6.56 feet (2.0 m) from the unit.
 - 9. Products:
 - a. Model 0196-93 - Satin Stainless Steel - Turbo-Pro - Automatic High Speed Hand Dryer - HEPA Filter - ADA Compliant - (110-120V) - Surface-mounted.

2.7 Mirrors

- A. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass, ASTM C1036.
 - 1. Angle Frame: 0.05 inch (1.3 mm) angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 - 2. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.
 - 3. Products:
 - a. Model 0600 Series - Stainless Steel Inter-Lok Angle Frame - Tempered Glass Mirror.

2.8 Soap Dispensers

- A. Soap Dispenser: Liquid soap dispenser, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
 - 1. Mounting: Surface.
 - 2. Minimum Capacity: As indicated in product listing.
 - 3. Products:
 - a. Model 0359 - Soap Dispenser - Foam, Vertical - 40 oz (1.18 L) - Surface-mounted.

2.9 TOILET Tissue DISPENSERS

- A. Toilet Tissue Dispenser: Double roll, surface-mounted, for jumbo rolls.
 - 1. Products:
 - a. Model 0039 - Toilet Tissue Dispenser - Low Profile, Jumbo Roll - Surface-mounted.

2.10 Under-Lavatory Pipe Enclosure

- A. Under-Lavatory Pipe Enclosure:
 - 1. Provide cover over all under lavatory exposed piping and equipment. Cover shall comply with ADA Standards.
 - 2. Construction: Rigid high-impact, stain resistant PVC.
 - 3. Thickness: 0.093"
 - 4. Fasteners: Stainless steel
 - 5. Size: Compatible with sink specified.
 - 6. Product: Tru-Bro Lav Shield; IPS Corporation.

2.11 Materials

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- D. Fasteners, Screws, and Bolts: Hot dip galvanized; tamperproof; security type.

2.12 Fabrication

- A. Traditional Collection:
 - 1. Basic Construction Requirements:
 - a. Doors: Type 304, 22 gauge, 0.0312 inch (0.79 mm) stainless steel, double pan construction, with 1/4 inch (6 mm) thick structural fiberboard core.
 - b. Cabinets: Type 304, 22 gauge, 0.0312 inch (0.79 mm) stainless steel, formed perimeter trim with 1/4 inch (6 mm) return to wall four sides; joints welded, sight-exposed welds finished to match sheet finish.
 - c. Hinges: Heavy-duty stainless steel multi-staked piano hinge, 3/16 inch (5 mm) diameter barrel, full length of cabinet; hinge leaves spot-welded to door and cabinet body.
 - d. Locks: Tumbler locks, keyed alike other toilet accessory locks, with one key for each lock.
 - e. Cabinet and Door Finish: No.4 satin finish.

2.13 Finishes

- A. Stainless Steel: Satin finish, unless otherwise noted.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.

3.2 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
- D. Coordinate installation of under-lavatory enclosure with sink and piping installed. Trim as required to provide tight fit around basin. Fasten to wall with fasteners and expansion shields as required by wall construction.

3.3 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

**SECTION 11 6833
ATHLETIC FIELD EQUIPMENT**

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide all equipment and materials and do all work necessary to furnish and install the athletic equipment, as indicated on the drawings and as specified herein. Athletic equipment shall include, but not be limited to:
 - 1. CBTS1830 - ComBox® for Track Surfacing

1.02 RELATED WORK

- A. Examine contract documents for requirements that affect work of this section. Other specification divisions and sections that directly relate to the work of this section include, but are not limited to:
 - 1. Division 03 – Concrete; Sections: Cast-in-Place Concrete
 - 2. Division 26 – Electrical
 - 3. Division 31 – Earthwork; Sections: Excavation and Backfill and Establishment of Sub-Grade Elevations
 - 4. Division 32 – Exterior Improvements; Sections: Athletic and Recreational Surfacing, Concrete and Asphalt

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. National Federation of State High School Associations (NFHS)
 - 2. National Collegiate Athletic Association (NCAA)
 - 3. International Association of Athletics Federations (IAAF)
 - 4. American Sports Builders Association (ASBA)
 - 5. Manufacturers Data and Recommended Installation Requirements

1.04 SUBMITTALS

- A. Manufacturers Product Data
 - 1. Provide manufacturers product data prior to actual field installation work, for Architects or Owners representative's review.
- B. Shop Drawings
 - 1. Provide drawings of the manufacturers recommended installation and foundation requirements prior to actual field installation work, for Architects or Owners representative's review.

1.05 QUALITY ASSURANCE

- A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

1.06 PRODUCT DELIVERY AND STORAGE

- A. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Owners representative. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

PART 2 - PRODUCTS

2.01 CBTS1830 - ComBox® for Track Surfacing

- A. BASE: CBTS1830 - ComBox® for Track Surfacing as Manufactured and Supplied by:

Sportsfield Specialties, Inc.
P.O. Box 231
41155 State Highway 10
Delhi, NY 13753
p. 888-975-3343
www.sportsfieldspecialties.com

- B. COMPONENTS:

1. CBTS1830 - ComBox® for Track Surfacing
 - a. Dimensions: 18"W x 30"L x 14"H
 - b. Box: 3/16" (0.1875") Aluminum Construction, Welded Frame with Open Bottom Having the Following Attributes:
 - i. 1/8" (0.125") Aluminum Adjustable Main Lid Support Ledge
 - ii. 3/16" (0.1875") Aluminum Removable Divider Panel
 - iii. 1" PVC Drain Stub for Positive Drainage Connection
 - iv. Leveling Bolts
 - c. Main Lid: 1/8" (0.125") Aluminum Construction with the Following Attributes:
 - i. 1/2" (0.50") Recess Designed to Accept Synthetic Track Surfacing by Others
 - ii. Secured with Cam Locks and is Pad Lockable
 - iii. Includes Wire Feed Cutouts
 - d. Hand Hole Covers: 1/8" (0.125") Aluminum Construction with the Following Attributes:
 - i. Designed to Accept Synthetic Track Surfacing Structural Spray or Urethane Top Coat by Others
 - ii. Secured with Hex Key
 - iii. Includes Wire Feed Cutouts
 - e. Assembly Hardware

PART 3 - EXECUTION

3.01 INSTALLATION OF EQUIPMENT

- A. All Utility Boxes shall be installed as recommended per manufacturer's written instructions and as indicated on the drawings.

END OF SECTION

**SECTION 22 0000
PLUMBING SCOPE OF WORK**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, and other Division 01 Specification Sections, apply to this Section.

1.2 REQUIREMENTS

- A. The conditions as defined in Division 22 – Common Work Results for Plumbing, shall apply to all Division 22 specifications.
- B. This contractor shall carefully read the above-mentioned documents and study the drawings of all trades. He shall be responsible for neglect to read or attend to any paragraph or items contained herein.

1.3 INTENT

- A. It is the intent of this specification and accompanying drawings to provide Plumbing systems, as specified herein and as shown on the contract drawings. The drawings show the general arrangement and extent of the work to be done. Exact location and arrangement of all components shall be determined as the work progresses. Plans are subject to such modification as may be necessary at the time of installation in order to meet construction conditions. Any adjustments shall be made by the Contractor, without extra charge.
- B. The project is to be completed during normal working hours.

1.4 WORK INCLUDED

- A. These specifications and accompanying drawings are intended to cover the furnishing by this Contractor of all labor, material and equipment of every kind necessary for the complete installation of the various systems and such other material and equipment as hereinafter specified and shall not be limited to the following:
 - 1. Provide domestic hot water, hot water return and cold water piping.
 - 2. Provide sanitary sewer and vent piping.
 - 3. Provide piping, valves and fittings and piping accessories for the various systems.
 - 4. Provide excavation and backfill for below grade work.
 - 5. Provide painting all exposed piping systems.
 - 6. Provide pipe insulation of plumbing systems (all domestic water systems)
 - 7. Provide plumbing fixtures.
 - 8. Provide drainage specialties: cleanouts, oil interceptor, floor & trench drains, etc.
 - 9. Provide expansion joints, loops, anchors and guides.
 - 10. Provide steel supports and hangers for all equipment and piping.
 - 11. Provide disinfection and flushing of all water piping.
 - 12. Provide testing, adjusting and placing in service all systems and equipment installed.
- B. The above list is presented for general guidance only and does not necessarily cover the entire requirement of the project as shown on the drawings and/or specified hereafter.
- C. The following items of work related to Plumbing will be performed by others as follows:
 - 1. The General Contractor shall provide all foundations and pads for equipment, paint all piping in finished areas, provide all base flashing on roof, build in all sleeves, unless otherwise noted.

2. The Plumbing Contractor shall provide floor drains for HVAC equipment. Drainage piping from equipment to drains shall be by the HVAC Contractor.
3. The Electrical Contractor shall do all power wiring for equipment.
4. The General Contractor shall install all access panels furnished by the plumbing contractor.

1.5 WORK AS A SUBCONTRACTOR

- A. When the Plumbing work is subcontracted, the exact scope of work may be limited or added to at the discretion of the General Contractor. A subcontractor shall, therefore, verify the extent of his work with the General Contractor.

1.6 RELATED WORK SPECIFIED ELSEWHERE

The following related work items are included in separate divisions and Sections as follows:

- A. General Requirements, Division 01.
- B. Site Work – Division 31, 32
- C. Concrete – Division 03.
- D. Roof Flashing – Division 07.
- E. Painting – Division 09.
- F. Common Work Results for Plumbing – Division 22.
- G. Electrical – Division 26.

1.7 REFERENCES

- A. 2020 International Plumbing Code
- B. 2020 International Building Code
- C. All State and Local Rules and Regulations
- D. ASPE Guidelines
- E. CISPI Guidelines

PART 2 - PRODUCTS

2.1 GENERAL

- A. As specified in the following related sections.

PART 3 - EXECUTION

3.1 GENERAL

- A. It is the intent of the Drawings and Specifications and the contractor responsibility is to provide a complete code compliant workable system ready for the Owner's operation. Any item not specifically shown on the Drawings or called for in the Specifications, but normally required to conform to the intent, are to be considered a part of the Contract.

END OF SECTION

**SECTION 22 0500
COMMON WORK RESULTS FOR PLUMBING**

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 general requirements that apply to the Plumbing and Plumbing Controls.
- B. The following work is specified under other Divisions, unless otherwise noted or specified hereinafter:
 - 1. Painting except as herein specified, Division 09.
 - 2. Electrical Power, Division 26.
 - 3. Installation of starters, contractors, thermal overload switches and remote push buttons, Division 26.

1.3 INTENT

- A. Requirements specified herein shall govern applicable portions of Plumbing whether so stated therein or not.
- B. It is the intent of this specification and accompanying drawings to describe and indicate the general manufacture, erection and installation of the equipment and connection to same specified herein and shown on the drawings. It is not intended that the specifications and drawings describe and indicate each piece of equipment required for installation, for where items are intended or required for satisfactory installation and are considered to be the accepted practice of the trade, they shall be considered to be both specified and indicated. Drawings are diagrammatic in nature; for piping systems; water piping is tapped off the bottom of the pipe and steam and steam condensate piping is tapped off the top of the pipe; provide all tees, elbows and swing joints as required for hookup to coils or branch piping as required for this work whether they are indicated on the drawings or not.
- C. It shall be understood that the Contractor as hereinafter mentioned shall be the Plumbing Contractor unless specifically noted otherwise.
- D. The Contractor shall furnish all plant, labor and material necessary for the complete and satisfactory installation of all Plumbing work for this contract.
- E. The Contractor shall assume the entire responsibility for the materials, workmanship and satisfactory operation of the various mechanical systems, and other work as specified herein and/or as shown on the drawings.
- F. The Contractor shall schedule and coordinate all work in close cooperation with all trades working on this project.
- G. All drawings and portions of the drawings, all floor plans, risers, details, schematics and specifications indicated shall apply and are part of the plumbing contract.
- H. Any discrepancy or conflict noted between or within the above referenced documents shall be brought to the attention of the Architect/Engineer, in writing, a minimum of three (3) days prior to submittal of bids. The Architect/Engineer shall resolve issues prior to bid submittal.
- I. This Contractor shall carefully read the above mentioned documents and study the drawings of all trades. He shall be responsible for neglect to read, or attend to, any paragraph or items contained therein. Failure to bring any conflicts or discrepancies to the attention of the Architect/Engineer, in writing, prior to bid submittal shall not constitute grounds for extras and/or change orders. Costs resultant from this failure shall be borne by this Contractor.

1.4 DEFINITIONS

- A. Following definition of terms and expressions used in this section are in addition to listing given in Supplementary Conditions:
 - 1. "Provide" shall mean "furnish and install" unless otherwise indicated.

2. "Herein" shall mean the contents of a particular section where this term appears.
3. "Indicated" shall mean "Indicated on contract drawings".
4. 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, crawl spaces, and tunnels.
5. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
6. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
7. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
8. 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.
9. The following are industry abbreviations for plastic materials:
 - a. ABS: Acrylonitrile-butadiene-styrene plastic
 - b. CPVC: Chlorinated polyvinyl chloride plastic
 - c. NP: Nylon plastic
 - d. PE: Polyethylene plastic
 - e. PVC: Polyvinyl chloride plastic
10. The following are industry abbreviations for rubber materials:
 - a. CR: Chlorosulfonated polyethylene synthetic rubber
 - b. EPDM: Ethylene propylene diene terpolymer rubber
11. For additional abbreviations see the Abbreviations and Symbols Drawings.

1.5 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for establishing grades and elevations, and checking of all interferences, and shall verify all dimensions and locations in the field.
- B. Contract drawings for mechanical work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement of equipment, ducts, piping and approximate sizes and locations of equipment outlets. Mechanical trades shall follow these drawings in layout of their work, consult general construction, structural and electrical drawings to familiarize themselves with all conditions affecting their work, and shall verify spaces in which their work will be installed.
- C. The Contractor shall verify with the A/E before bidding any item of piping or piping arrangement which may be incomplete, incorrect, or indefinite. After contract is let, the A/E's decision shall be final.
- D. All trades shall cooperate and confer with each other as to locations of their materials and equipment before erecting work, so as to avoid interference as much as possible, and in such a manner that will in no way retard progress of construction. In instances where interferences develop, the contractor shall relocate the work as required by the A/E regardless of which work was installed first.
- E. Where job conditions require reasonable changes to indicated locations and arrangement, make such changes without extra cost to Owner. This is not to be construed to permit redesigning of the various systems.
- F. Additional and supplementary drawings may, from time to time, be furnished, and the same, when made, are to constitute a part of the original contract. These drawings will be made to clarify the contract drawings and will not depart materially therefrom.
- G. The A/E specifically reserves the right, up to the time of roughing-in, to exactly define the position of the equipment to be installed and connected to an arrangement of these connections.

- H. Special attention is called to the contract drawings and specifications involving general construction, electrical work and details thereon. Bidders are notified to carefully scrutinize these documents for the details affecting the performance of the mechanical trades.
 - 1. Install all supply piping with adequate stops on each supply to all fixtures and or equipment to be connected to distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures and or equipment. Install stops in locations where they can be easily reached for operation.
- I. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture or equipment. Valves are specified in Divisions 22 and 23.

1.6 WORK INCLUDED

- A. These specifications, and accompanying drawings are intended to cover the furnishing by this Contractor of all labor, material and all equipment of every kind necessary for the complete installation of the various systems, and such other materials and equipment as hereinafter specified, and shall include, but not be limited to the following:
 - 1. Sanitary drainage and vent system within the building.
 - 2. Drainage specialties, including cleanouts, oil interceptor, floor & trench drains, etc.
 - 3. Domestic hot water recirculating system within the building as indicated.
 - 4. All piping, valves and fittings for the various systems.
 - 5. All expansion joints, loops, anchors and guides.
 - 6. Steel supports and hangers for all equipment and piping.
 - 7. Insulation for piping and equipment as herein specified.
 - 8. All plumbing fixtures as hereinafter specified, including handicapped fixtures compliance with the handicapped code.
 - 9. All painting of pipe and equipment in the mechanical rooms and other unoccupied areas, and all painting of piping in no ceiling areas.
 - 10. Flush all water pipe and disinfect as specified.
 - 11. Setting of all sleeves and inserts in place.
 - 12. Testing, adjusting and placing in service all systems and equipment installed.
 - 13. Install all supply piping with adequate stops on each supply to all fixtures and or equipment to be connected to distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures and or equipment. Install stops in locations where they can be easily reached for operation.
 - a. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture or equipment. Valves are specified in Divisions 22 and 23.
 - 14. Domestic hot water system including valves, supply valves, supply piping, and return piping to fixtures and equipment requiring hot water as indicated.
 - 15. Complete natural gas piping system from the gas meter/regulator set to all fixtures and equipment within the building requiring gas. Terminate at heating equipment or water heating equipment with gas cock.
 - 16. Water supply specialties including shock absorbing devices, backflow preventers, wall hydrants, thermometers, etc.
 - 17. All excavation and backfilling required for the above work.
 - 18. All necessary valves, gas cocks and shutoffs.
 - 19. All plumbing fixtures, drains, floor drains, equipment, piping, fittings, valves, etc. shall be commercial for schools.
- B. The above is presented for general guidance only and does not necessarily cover the entire requirement of the project as shown on the drawings and/or as specified hereinafter.

1.7 SCHEDULE OF WORK

- A. The Contractor shall schedule all of his work to conform to the Job Progress Schedule as submitted by the General Contractor or Construction Manager, and approved by the A/E.

1.8 RELATED WORK SPECIFIED ELSEWHERE

A. The following related work items are included in separate Divisions as follow:

1. General Requirements – Division 01
2. Site Work – Division 31, 32, 33
3. Concrete – Division 03
4. Roof Flashing – Division 07
5. Painting – Division 09
6. HVAC – Division 23
7. Electrical – Division 26

B. The following items of work related to plumbing will be performed by others as follows:

1. The General Contractor shall paint all piping in finished areas, provide all base flashing on roof, and build in all sleeves, unless otherwise noted.
2. The Electrical Contractor shall do all power wiring for plumbing equipment unless otherwise noted.
3. The General Contractor shall install all access panels furnished by the Plumbing Contractor.
4. The HVAC Contractor shall provide drainage piping from his equipment to drains provided by the Plumbing Contractor.

1.9 WORK AS A SUBCONTRACTOR

A. When the plumbing work is subcontracted, the exact scope of work may be limited or added to at the discretion of the General Contractor. A subcontractor shall, therefore, verify the extent of his work with the General Contractor.

1.10 INTERFERENCE WITH THE OWNER'S NORMAL OPERATION

- A. All work shall be performed in such a manner as not to interfere with the normal work operations in adjacent spaces or buildings.
- B. In no way shall the Contractor:
1. Block or restrict the means of egress for adjacent spaces.
 2. Decrease the fire rating of walls, partitions, ceilings, doors, or combination thereof of adjacent spaces or of means of egress.
 3. Interrupt safety systems or in any way adversely affect the safety of people or materials in adjacent spaces.
- C. The Contractor shall provide acoustical isolation of the work area via temporary doors, partitions, etc., adequate to allow normal work functions.
- D. The Contractor shall provide exhaust fans, dust proof temporary partitions and any containment measure required to prevent dirt, dust, or fumes from reaching adjacent workspaces.
- E. All personal traffic and material delivery shall be routed to absolutely minimize travel through adjacent work area.

1.11 VISIT TO SITE

A. The Contractor shall visit the site and thoroughly acquaint himself with all existing conditions relative to type and source of service available. He shall verify location and extent of these services and consider routing, interferences and excavation required by the contract and any and all other difficulties that may be encountered.

- B. Submission of a proposal shall be construed as evidence that such an examination has been made.
- C. Failure to visit the site shall not constitute sufficient reason to warrant claims for extra monies for difficulties not apparent in the contract documents.

1.12 MANNING THE PROJECT

- A. The Contractor shall, upon initiation of construction, keep a suitable force of men on the site at all times in order to lace all sleeves, inserts, outlet boxes, fixtures and provide all other openings as are required for the satisfactory installation of equipment.

1.13 FEES AND PERMITS

- A. The Contractor shall secure all permits and pay all fees, required by local and state governing bodies, necessary to complete his phase of the construction. Failure to investigate all applicable payments before the bid submission shall not constitute grounds for additional monies from the Owner. The Owner shall be furnished with all certificates of approval.
- B. The Contractor shall provide insurance and bonding as required by the Building Owner or as stated in the General Conditions.

1.14 CODES AND STANDARDS

- A. The design, construction and installation of all materials and equipment shall be in compliance with the latest edition of all national, state and local codes or standards.
- B. The codes and standards referred to are minimum standards. Where the requirements of these specifications and the accompanying drawings exceed those of the codes and standards, the drawings and specifications shall be followed.

1.15 BASIS OF DESIGN

- A. The layout is based upon the use of particular items of equipment, identified by manufacturer's make and model number. Dimensions, arrangements and service connections required for these particular items have been considered in making the layout. The contractor may use the equipment of any manufacturer whose name is approved for substitution on that item of equipment after he had ascertained that all provisions of MATERIAL SUBSTITUTIONS will be complied with and that all required service connections will be made at no additional cost to the Owner.
- B. Except where dimensions are shown, the drawings are diagrammatic and shall not be scaled. Exact location of fixtures, apparatus, duct work and piping shall be determined by dimensions on the site. Contractor shall refer to architectural plans and details for exact dimensions.
- C. The drawings indicate the locations of apparatus, fixtures, and piping shall be followed as closely as possible. If before the installation it is found necessary to change the location to accommodate conditions at the building, such changes shall be made at no additional cost to the Owner, and as approved by the Architect/Engineer.
- D. Equipment requiring operation, service, or maintenance during the life of the system shall be made easily accessible.
- E. Piping shall not be run within 48" of switchboards, panelboards, or motor control centers.

- F. Use of open-flame devices in work shall be accompanied by fire extinguishing apparatus within 25 feet of work location. Provide Fire Watch review of the work during each shift.

1.16 QUALITY OF MATERIALS

- A. Where a specific model and manufacturer of equipment is specified, the Contractor shall provide what is specified without substitution. Where specified as "or approved equal", the Contractor may substitute equipment except that the burden is upon the Bidder to prove such equality. If the Bidder elects to prove such equality, he must request the Architect's approval in writing to substitute such item for the specified item, stating the cost difference involved with supporting data, and samples, if required, to permit a fair evaluation of the proposed substitute with respect to quality, serviceability, warranty, and cost.
- B. Where a specific model of equipment is specified along with an approved equal manufacturer, no substitution will be allowed. The Contractor shall submit one of the manufacturers listed.
- C. Final approval of competitive equipment is reserved by the Engineer when, in the Engineer's opinion, the equipment does not correspond to that specified.

1.17 MATERIAL SUBSTITUTIONS

- A. Material substitutions shall be allowed only where "or equal" is stated.
- B. Material substitution submittals shall, include complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance, test data and evidence that the proposed manufacturer or his established representative maintains a qualified service organization including spare parts and is available for competent service on short notice.
- C. Each bidder by submitting his bid represents that the proposal of such article, device, product, material, fixture, form or type of construction by name, make, catalog number of manufacturer which varies with the equipment specified shall be incorporated into the project without claims against the Owner for additional cost. The bidder shall be responsible for all additional costs incurred by others due to the substitutions.
- D. The Architect/Engineer shall have the final approval of all submitted substitutions.

1.18 SUBMITTALS

- A. Approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.
- B. All submittals shall bear a stamp or notation indicating that the Contractor has reviewed and approved the submittals.
- C. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and shall clearly identify equipment being submitted.
- D. Submittals shall be marked to show specification reference including the section and paragraph numbers.
- E. Submit each section separately and include the following:
 - 1. Information which confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
 - 2. Submittals on all pumps shall be complete with performance curves marked with the design points.
 - 3. Submittals on electrical equipment shall be complete with all power and control wiring diagrams.
 - 4. Vibration isolators shall include operating weight and load distribution at each mounting point.

- F. The Contractor agrees that failure of manufacturer's submittal to conform to the above will result in a manufacturer's disqualification on this project.
- G. Submit samples as directed of items called for in the specifications; samples of the materials which the manufacturer will actually ship shall be submitted for approval after award of contract and properly labeled on this project.

1.19 PRODUCT HANDLING

- A. Following is in addition to Protection of Work and Property, General Requirements:
 - 1. Responsibility for care and protection of mechanical work rests with the Contractor until it has been tested and accepted.
 - 2. After delivery, before, during and after installation, protect equipment and materials against theft, injury and damage from all causes.
 - 3. Protective covers, skids, plugs, caps and coating shall be provided to protect equipment materials from damage during construction.
 - 4. All equipment and material shall be stored under cover and off the ground.
 - 5. For outdoor storage, protective covers of sheet plastic shall be provided. Covers shall be of gauge required for the area involved and shall be reinforced to withstand wind, rain, sleet and snow. Equipment and material shall be set on skids or platforms of sufficient height to avoid deterioration from spattering and ground water.
 - 6. Plug open ends of pipes when work is stopped to prevent debris from entering the pipes.
 - 7. Protect plumbing fixtures and other equipment with enamel or glazed surface, from damage by covering and/or coating, as recommended in Bulletin "Handling and Care of Enameled Cast Iron Plumbing Fixtures," issued by Plumbing Fixture Manufacturers' Association.
 - 8. Coat polished or plated metal parts with Vaseline immediately after installation.
- B. The Contractor shall receive, properly house, handle, hoist, and deliver to proper location, equipment and other materials required for the contract.
- C. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

1.20 COORDINATION DRAWINGS

- A. Detailed layout shop drawings on all systems as required in Division 01 – Project Coordination, Division 22, 23, and 26, must be coordinated with field erection drawings for Architectural, HVAC, Plumbing, Fire Protection, and Electrical Systems by the respective contractors.
- B. Prepare coordination drawings for all areas by building, floor area and/or phase, of the project. Close attention should be implemented where limited space availability necessitates maximum utilization of space for efficient installation of different components.
- C. Mechanical, Electrical and Plumbing Prime Contractors are responsible to prepare coordination drawings to a Scale of $\frac{1}{4}" = 1'-0"$ or larger; detailing major elements, components, and systems of mechanical and electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including but not limited to the following:
 - 1. Proposed locations of ductwork, piping, conduit, equipment, and materials.
 - 2. Clearances for installing and maintaining insulation.
 - 3. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
 - 4. Equipment connection and support details.

5. Exterior wall and foundation penetrations.
 6. Fire rated wall, floor, ceiling, and roof penetrations.
 7. Sizes and location of required concrete pads and bases.
 8. Valve stem movement.
 9. Sleeves.
- D. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations. Clearly define relationships between sleeves, piping, ductwork, conduit, ceiling grid, lighting, fire sprinkler, HVAC equipment and other mechanical, plumbing, and electrical equipment with other components of the building such as beams, columns, ceilings, and walls.
- E. Prepare reflected ceiling plans to coordinate and integrate installations of air outlets and inlets, light fixtures, communication systems components, sprinkler, and other ceiling mounted items.
- F. Resolve conflicts between trades, prepare composite coordination drawings and obtain signatures from all affected Prime Contractors on original composite drawings. Submit coordination drawings to the Architect/Engineer and Construction Manager for approval.
- G. Mechanical, Electrical and Plumbing Prime Contractors are to first submit their respective shop drawings for approval, to the Architect/Engineer, in order to make any necessary changes prior to going through the coordination process.
- H. Coordination drawings to be signed off by affected Contractors within 45 days of Notice to Proceed. A Coordination drawing timeline schedule shall be developed and tracked.
- I. The coordination drawings shall be coordinated with the construction and phasing schedule.
- J. The routing process will begin with the HVAC Contractor who shall take the lead in the coordination of their work with all affected trades.
- K. The HVAC Contractor shall prepare CAD drawings to be used as the basis for coordination drawings in all areas or as determined by the Construction Manager (Scale: 1/4" = 1'-0" or larger). These drawings shall be completed in digital format. All architectural features shall be accounted for in preparation of this drawing; i.e., permanent, casework, interior columns, partitions, finish ceiling and height, lighting and roof elevations, etc. The HVAC Contractor will provide CAD files and drawings showing all of the approved ductwork. HVAC Contractor is to locate all piping with orange lines. Forward drawings to the Plumbing Contractor.
- L. The Plumbing Contractor is to locate the plumbing lines with blue lines and sprinkler lines and head locations with red lines, and resolve all conflicts and determine locations and elevations, and forward drawing to the Electrical Contractor.
- M. The Electrical Contractor to indicate all lighting fixtures, panels with associated clearances, duct banks, bus duct, conduit racks and all individual conduits 1 1/2" and larger in with green lines and resolve all conflicts and determine locations and elevations and forward to the General Construction Contractor. The General Construction Contractor will have the last coordination review. Provide overlaid coordination drawings for all General Construction work and resolve all conflicts. All architectural features shall be detailed clearly, i.e. permanent casework, interior columns, partitions, finish ceiling and roof elevations, etc. Provide a ceiling layout detailed coordination drawing showing ceilings, lights, diffusers, etc.
- N. Contractors to provide underground coordination drawings for all underground utilities; show exact location of piping stub ups, floor drains, etc. as required.
- O. Prime Contractors shall be responsible for all costs associated with creating CAD files.

- P. All coordination meetings will be held in the Construction Manager's field office or as required by the Architect/Engineer. As each coordination drawing is completed, Contractors are to meet with the Construction Manager to review and resolve all conflicts on the coordination drawings. Contractors are required to distribute shop drawings, cut sheets and submittals to other Prime Contractors where appropriate. Approved coordination drawings will also be available for reviewing at the Construction Managers field office.
- Q. All Contractors shall provide a hard copy of the coordination drawings for review by the Architect/Engineer.
- R. Once complete and signed off, the HVAC, Plumbing and Electrical Contractors will submit dimensioned wall and slab penetration drawings and housekeeping pad drawings to the appropriate parties.
- S. If the coordination drawing process is not complete, Mechanical, Electrical and Plumbing Contractors will provide wall penetration drawings to the General Construction Contractor no later than five (5) days prior to wall erection.
- T. All Prime Contractors must install the work in accordance with the coordinated drawings at no additional cost to the Owner. No additional compensation will be made for extra ductwork offsets, piping and/or conduit or retrofit work due to improper component location, or lack of Contractor(s) coordination.
- U. All Prime Contractors shall take special care in verifying with the Electrical Contractor that the equipment matches the characteristics of the power being supplied. The Electrical Contractor is similarly bound.
- V. The Mechanical, Electrical and Plumbing Drawings are schematic in nature and are not intended to show every offset and detail. The Mechanical, Electrical and Plumbing Contractors will make adequate provisions in their bid to accommodate the actual conditions, provide all required ductwork, piping and conduit offsets per the coordination drawings, without additional cost to the Owner.
- W. The Mechanical, Electrical and Plumbing Contractors shall hang streamers from all above ceiling equipment that will require access. This is in addition to any specification requirements for tags, labels, etc. Shop drawings should also highlight these areas for Architect/Engineer's review. In addition, the Contractors shall notify the Construction Manager and Architect/Engineer of all areas where equipment maintenance access is difficult. Coordinate architecturally placed access doors with points of mechanical/electrical systems requiring that access.
- X. Specific Requirements – Required Information to be provided on Coordination Drawings:
 - 1. General Construction/Structural Work Information including but not limited to:
 - a. Openings and sleeve locations required in slabs, walls, beams, and other structural elements, including required openings not indicated on the Contract Documents.
 - b. Slab edge locations
 - c. Embed locations, as described above. Note embedded steel angles at edges of sump and sewage ejector pits, to accept basin covers.
 - d. Wall and chase spaces for housing HVAC, Plumbing, or Electrical items.
 - e. Access doors in coordination with the respective contractor systems.
 - f. Other specific/critical conditions unique to this Project, not noted above but necessary to assure proper coordination.
 - 2. HVAC Work Information including but not limited to:
 - a. Sizes and bottom elevations of rectangular ductwork, including angle bracing, flanges, and support systems.
 - b. Sizes and centerline elevations of round ductwork, piping and conduit runs
 - c. Acoustical lining in ductwork.

- d. Identification of ductwork pressure class.
 - e. Dimensions of major components, such as dampers, valves, diffusers, registers, cleanouts, coils, VAV boxes, HVAC equipment, and electrical distribution equipment.
 - f. Fire-rated enclosures around ductwork.
 - g. Access panels required.
 - h. Other specific/critical conditions unique to this Project, not noted above but necessary to assure proper coordination
3. Plumbing and Fire Protection Information including, but not limited to:
- a. Sizes and centerline elevations of piping runs.
 - b. Locations of plumbing valves, equipment, and fixtures.
 - c. Locations of standpipes, floor control assemblies, fire hose valves, mains, piping, branch lines, pipe drops, sprinkler heads, fire pumps/controllers, and jockey pumps.
 - d. Other specific/critical conditions unique to this Project, not noted above but necessary to assure proper coordination.
4. Electrical Work Information including, but not limited to:
- a. Runs of vertical and horizontal conduit, 1 1/4" diameter and larger
 - b. Light fixture locations
 - c. Exit light locations
 - d. Smoke detector and other fire alarm locations
 - e. Panelboards, switchboards, switchgear, transformers, busways, generators and motor control center, exit signs, and emergency battery pack locations.
 - f. Locations of pull boxes and junction boxes, dimensioned from column centerlines
 - g. Access panels required.
 - h. Other specific/critical conditions unique to this Project, not noted above but necessary to assure proper coordination.
5. Ceiling Systems and Plenum Space Information including, but not limited to:
- a. For HVAC, Plumbing, Fire Protection, Fire Alarm, Electrical, Controls and Telecommunications Work penetrating acoustical ceilings, show locations of each item (including sprinkler heads, diffusers, grilles, access doors, light fixtures, smoke detectors exit signs, speakers, and other visible ceiling mounted devices) relative to the acoustical ceiling grid.
 - b. Locate components within ceiling plenums to accommodate layout of light fixtures indicated on Drawings. Clearly indicate areas of conflict between light fixtures and other components on Coordination drawings.
 - c. Other specific/critical conditions unique to this Project, not noted above but necessary to assure proper coordination.
- Y. The Sheet Metal Contractor shall prepare his work on reproducibles and submit 1/4" scale CAD drawings of the sheet metal duct field erection shop drawings for the coordination procedures, and each Contractor will supply the necessary qualified personnel for these procedures which will be conducted by the General Contractor. The HVAC, Plumbing and Fire Suppression work to the drawings where conflicts are noted and achieve solutions to any conflicts that may exist.
- Z. The General Contractor will be required to signify his acceptance of the results of the coordination procedures by signing and dating the master coordination print.
- AA. Each Contractor will be required to correct his field erection drawing(s) used as a basis for the coordination procedures to complement the results of the procedures prior to submitting same for approval. No field erection shop drawings will be accepted for approval without having been coordinated.

- BB. As part of the coordination procedures, applicable "Approval" or "Approved as Noted" copies of other trades' shop drawings will be transmitted to the Contractor. It will be each Contractor's responsibility to check these shop drawings to ascertain what effect, if any, these shop drawings have on that portion of the work under his direct responsibility. Each contractor will advise the General Contractor within forty-eight (48) hours of receipt of the shop drawings, in writing, indicating receipt of same and whether they have any effect on the work of his contract.

1.21 ELECTRICAL

A. Power Wiring

1. For the purpose of this specification, power wiring shall be defined as follows:
 - a. All wiring from the power source panelboards (or switchboard) to the disconnect switch to the equipment, and final connection to the equipment.
 - b. All wiring to control panels as indicated in the Electrical and Plumbing Contract Documents. (All control panels not indicated on the Electrical Contract Documents as receiving power shall do so by jumpers from other control panels, this wiring shall be considered control wiring as defined below).
2. All power wiring from the power source to the above noted switches and wiring from these switches to the equipment, including final connection to same, shall be provided under Division 26, Electrical.

B. Control Wiring

1. All other wiring required, whether line voltage or low voltage, internal or external to provide for the operation of the equipment shall be considered as control wiring.
2. All control wiring throughout the building, including wiring installed at piping, or as specified shall be provided under this Division 23.

- C. The Contractor shall furnish all motors, mounts, motor starters and remote mounted push-button controls for all electrically operated equipment furnished as part of the contract. The Contractor shall furnish all safety disconnects where described hereinafter. The Contractor shall furnish all speed control switches for all multi-speed motors. All motors shall have copper windings. (Aluminum windings will not be acceptable).

- D. This Contractor is completely responsible for the coordination with all other trades as to the correct voltage for all equipment requiring power. Equipment and or changes required to meet the project voltages will be the responsibility of this contractor.

- E. All push-button switches and starters shall be mounted under Division 26, Electrical.

- F. The Contractor shall provide all controls and control devices, all mounting for controls and all other electrical devices as specified and necessary for the complete installation and satisfactory operation of all electrically operated controls furnished under this Division.

- G. All locally mounted starters shall be furnished under Division 22, except as noted below. Where indicated hereinafter, starters shall be furnished as an integral part of equipment. Starters furnished in motor control centers shall be provided in Division 26, Electrical (refer to Electrical Drawings). Control of starters in motor control centers feeding plumbing equipment shall be provided under Division 23.

- H. Starting equipment of each motor shall be of the proper voltage and HP rated for the motor it is to serve. All starters shall be of the enclosed type; NEMA Type 1, for general-purpose enclosures; NEMA Type 4 for watertight enclosures, and NEMA Type 12 for the dust-tight enclosures. Location of motor shall determine type of enclosure to be used.

- I. Manual motor starters for single-phase motors shall be one or two poles as required, consisting of a snap switch combined with a thermal overload device. It shall be impossible for the switch to be held in a closed position under a sustained motor overload. For resetting the overload mechanism, the switch lever shall be of a design where it has to be moved to the "off" position. Starter shall be enclosed in type of enclosure for area in which it is to be used.
- J. Magnetic starters for 3-phase motors shall be furnished with 110 volt holding coils, 120-volt fused transformers, normally open and normally closed auxiliary contact and overload relay heater elements in all three phases. Provide hand/off/auto selector switch along with running status lights and external reset button.
- K. Locate starters and associated starter controls in accessible locations wherever possible. Location of starters for roof mounted equipment above ceilings shall be located at accessible locations above ceiling. Locations shall be coordinated with furniture and equipment layouts for the optimum accessible location for installation and maintenance means
- L. The Contractor shall be completely responsible for the coordination control system with control interlocks between various items of plumbing equipment.

1.22 SCAFFOLDING

- A. The Contractor shall furnish and install scaffolding, ladders and runways required in connection with his work.

1.23 TEMPORARY OPENINGS

- A. Temporary openings not indicated, which may be required for purpose of bringing equipment into building, shall be as approved. General Contractor will perform work of providing and maintaining openings, and of restoring structure; but Contractor for whom temporary openings are provided shall bear costs thereof, and for restoring structure. Ample notice shall be given of size and location of such openings by Contractor requiring same.
- B. Holes provided in General Construction work to permit installation of lines for temporary services will, after removal of such lines, be patched as specified under Division 01.

1.24 TEMPORARY SERVICE

- A. Temporary services are specified under Division 01, "General Requirements".

1.25 EXCAVATION

- A. All excavation is unclassified. The Contractor shall inspect the site and make allowance in his bid for soil to be excavated since no compensation will be given where rock is encountered.
- B. The Contractor, unless otherwise noted on the drawings, shall do all excavations for trenches, foundations, and pits of whatever kind necessary for the installation of this work. Bottom of trenches shall have the proper uniform grade wherever possible, or unless otherwise directed.
- C. Trenches are to be excavated to the widths, lines and grades indicated on the drawings and/or specified in the appropriate sections of these specifications. Trenches for piping are to be excavated to a minimum width of one (1) foot plus the outside diameter of the pipe. The trench shall be excavated in a manner such that the pipe will be located in the center of the trench with the trench bottom having the proper uniform grade in the direction of flow. Trenches shall be deep enough to provide a minimum of four (4) feet fill over the piping except as may be otherwise indicated on the drawings.

- D. In each excavation, trenches shall be carried to six inches below invert of pipe. Pipe shall be surrounded in all directions by a six-inch layer of selected crushed stone or gravel. If rock is encountered, carry trench to a point six inches below pipe invert. No pipe shall be bedded directly upon rock but shall be cushioned by a six-inch layer of selected crushed stone or gravel.
- E. The Contractor shall do any shoring, bracing, etc., necessary to maintain the banks of his excavation, shall make good and damage done to property of adjoining premises or work of other contractors due to his failure to properly shore his excavation. The Contractor shall do all pumping required to keep his excavations free of water including rental of pumps, temporary power and labor.
- F. All excavations shall be left open until work has been inspected and approved by the Architect. Sufficient time shall be allowed after notice is given that work is ready for inspection for making all examinations and tests. Under no circumstances shall excavated material be left even temporarily, where it will interfere with the building or other Contractor's operations.
- G. Excavations which pass under or within eighteen (18) inches of columns or wall foundations shall be backfilled up to the level of columns or wall foundations with concrete mixed in proportions to one part cement, three parts sand and five parts coarse aggregate. Excavations shall not undermine foundations at a slope of 1:1 or greater.
- H. All earth backfilling shall be made in layers not to exceed eight (8) inches and each layer shall be thoroughly tamped into place before the next layer is placed. Backfilling shall be clean earth, free of stone, pieces of concrete, rubbish and other foreign materials. Material frozen in lumps or material softer than the adjoining soil shall not be used in backfilling. The Contractor shall distribute on the premises as directed, all earth remaining after the backfilling.
- I. Any necessary blasting shall be performed by experienced and competent personnel in the most careful manner. All local ordinances and laws relating to blasting and storing of explosives must be strictly observed. No explosives shall be stored in the project properly. All contractors shall be notified prior to any blasting.
- J. Explosives used shall be subject to approval of the Architect. The blasting shall be properly covered with blasting mats.
- K. Any rock encountered within five (5) feet of pipes of building walls shall be removed without blasting. Any blasting required shall be performed at such times as to meet reasonable request of the Architect.
- L. The Contractor will do all patching of bituminous surfaces, concrete walks, driveways, streets, etc., necessary to complete his work. All patching shall match the existing surfaces. Painting shall be done by personnel skilled in their trades.
- M. Provide adequate temporary crossovers for pedestrian and vehicular traffic including guard rails, lamps, flags, as directed; remove same when necessity for such protection ceases.

1.26 CUTTING AND PATCHING

- A. The Contractor shall provide all floor and wall cuts as required for piping penetrations of existing construction.
- B. No cutting of bearing walls, beams, etc., shall be done without the approval of the Architect. All patching and finishing, etc., shall match the surroundings. All cutting and patching shall be done by workmen skilled in the trades and in the employ of the General Contractor for the project. All cutting shall be done with saw type edges to give a neat and workmanlike appearance. All pipe holes shall be core drilled unless specified otherwise.

- C. Should it be necessary to do any cutting and patching due to the failure of this Contractor to give proper information to the General Contractor, it shall be done at the expense of the Plumbing Contractor.

1.27 PAINTING AND FINISHING

- A. Except as specified herein, the finished painting of Plumbing Work within the building and on the roof shall be as specified under Division 09.
- B. All mechanical equipment shall have a factory-applied prime and finish coat of paint. Galvanized surfaces shall be considered as finished surfaces for equipment rooms and items concealed from view. Plastic products shall be acceptable without a finish coat of paint. All items of equipment marred or rusted, even though factory finished, shall be repainted; steel angles and steel supports for ductwork, piping or miscellaneous equipment shall have a prime coat of paint before installation.
- C. Paint all exposed piping, equipment, and trim that does not have a factory applied finish. Refer to Division 09 "Painting" for paint materials, surface preparation and application of paint. Paint shall be semi-gloss, acrylic-enamel paint. Coat components with two (2) coats of finish paint over two (2) coats of rust inhibitive metal primer or approved equivalent based on component type.

1.28 CONCRETE WORK

- A. Concrete work shall be in accordance with Division 03.
- B. Provide 4" high concrete pads for floor mounted plumbing equipment as indicated on drawings.

1.29 SUSPENSION SUPPORT FOR EQUIPMENT

- A. All pipes and equipment that are suspended shall be connected directly to the building steel. Where hangers are required between building steel points, supplementary steel members shall be added by the Contractor as required to adequately support the load.
- B. Pipes and ducts shall not be supported from other pipes, ducts, or equipment.
- C. Hangers from joists shall be attached at the panel points. Pipes and ducts with weights of 50 pound per foot (total for single or multiple runs) routed parallel with bar joists shall be supported from a minimum of 3 joists at each hanger point (channel members between joists).

1.30 ACCESS PANELS – BUILDING

- A. Valves and equipment located concealed in walls or above ceilings and are otherwise inaccessible shall be furnished with an access panel for each location. A hinged inconspicuous type access panel complete with frame, of such size and so located as to provide proper access for service and maintenance.
- B. The minimum size of each access panel shall be 18" x 18" unless physical restraints require a smaller door.
- C. Where such equipment is located above removable concealed spline push up type acoustical tile or metal pan ceilings, it shall be considered as accessible if the acoustical material is arranged for access to the space above the ceilings.
- D. Access panels shall be Milcor "DW", or equal, for drywall locations and Milcor "K", or equal, elsewhere.
- E. Panels and frames shall be prime painted.

- F. Panels shall be furnished under this Division and installed under another Division of this Specification.
- G. Panel material shall be steel except that construction shall be all aluminum in bathroom applications.
- H. When access panels or doors are installed in fire rated construction, they shall be fire rated to match the construction.

1.31 FIRESTOP PENETRATION PROTECTION SEALING SYSTEM

- A. Where pipes pass through fire partitions, firewalls, floors or ceilings, install a firestop that provides an effective barrier against the spread of fire, smoke, gases and water. Fire-stop material shall be packed tight, and completely fill clearances between pipe, sleeves and structure. All crack voids or holes (up to 4" diameter) shall be sealed using 3M brand Fire Barrier Caulk CP25 or putty 303 or an approved equal. Larger diameter or square holes, 3M system 7902, 7904, 7902R or 7904R or approved equal shall be in accordance with manufacturer's instructions.
- B. Fire-stopping material shall maintain its integrity while preventing the passage of flame, smoke, gases, or water. Fire-stopping material shall be a one-part, intumescent elastomer noncombustible, noncorrosive and compatible with synthetic cable jackets as defined by ASTM E814 (UL 1479); and in addition, for insulation materials, melting points shall be a minimum of 1700 degrees F for one-hour protection and 1850 degrees F for 2-hour protection.

1.32 RECORD DRAWINGS

- A. The Contractor shall furnish record as-built drawings to the Architect at completion and acceptance of the job. Transparencies of the original drawings with corrections shall be submitted as specified in the General Requirements.
- B. Record all changes from installation originally indicated. Record final location of underground lines by depth from finished grade and by offset distances in feet and tenths to surface improvement such as buildings, curb, or edges of walks. Where work appears on two or more drawings, Contractor shall mark changes on all drawings. Contractor shall mark changes on all drawings. At completion, furnish the above required transparencies to the A/E for approval and record. Drawings shall be certified to be record of work installed and signed by the Contractor. Work shall not be accepted until such drawings have been delivered to the A/E.

1.33 GUARANTEE

- A. In addition to the requirements stated in the specifications, the Contractor must guarantee all equipment, materials, and appurtenances installed by him to be free from all defects for a period of one year from date of final acceptance.
- B. Upon written notice from the A/E, the Contractor shall promptly correct all defects without additional cost to the Owner. This Contractor shall adjust each part of the entire installation for proper working order. Reports are to be submitted to the A/E and adjustments repeated until the entire system is satisfactory. This Contractor must make good at his own expense, any defects in materials or workmanship that may appear.

1.34 CLEAN UP

- A. The Contractor shall be held responsible for the general clean-up of all areas affected by the work in the Contract. All rubbish and accumulative material shall be removed from the premises and the premises left "broom clean" upon completion.
- B. All stickers, rust, stains, labels and temporary covers shall be removed before final acceptance.

- C. Foreign matter shall be blown, vacuumed or flushed out of piping, pumps, fans, motors, devices, switches, panels, and equipment.
- D. Identification plates on equipment shall be free of excess paint and shall be polished.

1.35 OPERATION AND MAINTENANCE MANUALS

- A. Submit to the Engineer for approval three manuals covering details of operation maintenance for all apparatus requiring service. The Contractor shall arrange formal instruction sessions by competent representatives of the manufacturer for the Owner's operating personnel to cover the following:
 - 1. Plumbing Fixtures (all)
 - 2. Service telephone number, fax number, websites, email addresses, business and service addresses and mobile telephone numbers of the installing contractor, and manufacturer and supplier and parts counters of pumps, water heaters, backflow preventers, and other components comprising the systems.
 - 3. Manufacturer's operating and maintenance manuals, including detailed parts lists with numbers, power, and wiring diagrams for each piece of equipment and accessory requiring services or maintenance, the guarantee period and the name, address and phone number of the nearest sales and service organization for each item. Both on print and CD's (min 3 copies) form (PDF/MS Word).
 - 4. Cross out options that are not used on equipment sheets, highlight options selected.
 - 5. Step-by-step procedure for starting, stopping, setpoint adjustment, monitoring and alarm enunciation for each system.
 - 6. Copies of inspection certificates provided by the City, County, State and insurance companies.
 - 7. Routine maintenance procedures for all plumbing equipment.
- B. Obtain written statements from the Owner's representative acknowledging satisfactory completion of each item of the manuals.

1.36 INSTRUCTION TO OPERATIONAL PERSONNEL

- A. Plumbing Fixtures (all)
- B. Furnish the services of competent instructors to give full instruction to the designated Facilities personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system on the Contract Documents. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.
- C. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation. Provide 8 man-hours each of instruction for, pumps, water heaters, compressors, air dryers, vacuum pumps, and other equipment required by the Owner's personnel.
- D. Instruction shall cover routine maintenance, wiring and power wiring diagrams and component analysis, preventative maintenance and scheduling, starting and stopping, alarm resets, trend-logging, setpoint adjustment, emergency and normal shutdown/startup, relative pressure control system for the morgue, alarm date stamping and all else required by the Owner for complete usage/maintenance/adjustment of equipment in their intended systems.

- E. Obtain written statements from the Owner's representative acknowledging satisfactory completion of each item of instructions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. Materials and equipment shall be in accordance with the specifications as outlined in each specification section describing plumbing components, fixture valves, piping, etc.
- B. All components shall be according to ASTM, ANSI, CISPI, NFPA and Code standards.
- C. Electrical equipment shall bear the underwriter label.

3.2 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify, by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments, that all materials and accessories to be installed on the project comply with applicable specifications and standards and meet specified thermal and physical properties.

3.3 PROJECT MANAGEMENT AND COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specification to ensure efficient and orderly installation of each part of the work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their divwork is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule
 - 2. Preparation of the Schedule of Values
 - 3. Installation and removal of temporary facilities and controls
 - 4. Delivery and processing of submittals
 - 5. Progress meetings
 - 6. Pre-installation conferences
 - 7. Project closeout activities
 - 8. Startup and adjustment of systems
 - 9. Project closeout activities
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into the work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

3.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequenced.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Number of Copies: Submit three opaque copies of each submittal. Architect, through Construction Manager, will return one copy.
 - a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect and Construction Manager will retain two copies; remainder will be returned. Markup and retain one returned copy as a Project Record Drawing.
 - 3. Refer to individual Sections for Coordination Drawing requirements for work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project Site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

3.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project Superintendent, provide other administrative and supervisory personnel as required for proper performance of the work.

3.6 PROJECT MEETINGS

- A. General: Attend meetings and conferences at Project Site, unless otherwise indicated.
 1. Agenda: Be prepared for the meeting agenda. Distribute the agenda to all invited attendees.
 2. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Attend a preconstruction conference before starting construction, at a time convenient to Owner, Construction Manager, and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
 1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule
 - b. Phasing
 - c. Critical work sequencing and long-lead items
 - d. Procedures for processing field decisions and Change Orders
 - e. Procedures for requests for interpretations (RFIs)
 - f. Procedures for testing and inspecting
 - g. Procedures for processing Applications for Payment
 - h. Submittal procedures
 - i. Preparation of Record Documents
 - j. Use of the premises and existing building
 - k. Work restrictions
 - l. Owner's occupancy requirements
 - m. Responsibility for temporary facilities and controls
 - n. Construction waste management and recycling
 - o. Parking availability
 - p. Office, work, and storage areas
 - q. Equipment deliveries and priorities
 - r. First aid
 - s. Security
 - t. Progress cleaning
 - u. Working hours
 3. Minutes: Record and distribute meeting minutes.
- C. Pre-installation Conferences: Attend a pre-installation conference at Project Site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Construction Manager of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents
 - b. Deliveries
 - c. Review of mockups
 - d. Possible conflicts
 - e. Time schedules
 - f. Manufacturer's written recommendations
 - g. Acceptability of substrates
 - h. Temporary facilities and controls
 - i. Coordination with other work
 - j. Protection of construction and personnel
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Attend progress meetings at biweekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 1. Review schedule for next period.
 - a. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements
 - 2) Status of submittals

- 3) Off-site fabrication
 - 4) Site utilization
 - 5) Hazards and risks
 - 6) Progress cleaning
 - 7) Status of correction of deficient items
 - 8) Requests for interpretations (RFIs)
 - 9) Status of proposal requests
 - 10) Pending changes
 - 11) Status of Change Orders
 - 12) Pending claims and disputes
 - 13) Documentation of information for payment requests
3. Minutes: Record the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
- a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Equipment locations: All plumbing equipment shall be located to provide for manufacturer's recommended clearances, clearance for routine maintenance, clearance per code requirements and locations/clearances required for removal/replacement in the future.
1. Manufacturer's recommended clearances shall include space for proper airflow and non-short circuiting airflow pathway (plumbing equipment, etc), clearance for pumps (18" minimum around pumps), 30" clearance or complete access door swings clearances for tube pulls (heat exchangers, coil pulls, etc); locate piping to be clear of these locations.
 2. Provide minimum 36" clearance around water heaters, heat exchangers and other pressure vessels; note this is a minimum requirement, provide excess wherever possible. Provide minimum 48" clearance from power panels per the latest edition NEC having jurisdiction; include requirements for piping and ductwork at such locations.
 3. Locate equipment in mechanical rooms to allow for future removal and replacement. Include heights to overhead piping where applicable. Wherever possible, clearances shall include removal/replacement as a whole entity without knock-down.
 4. Access platforms with metal grating shall be provided for equipment located outdoors such for power and control panels for equipment located on dunnage. This access system shall provide for maintenance and requirements per codes having jurisdiction. Platforms shall include stairs and handrails per OSHA regulations.
 5. Locate roof mounted equipment minimum 10' away from edges of roof. Where equipment is located closer, provide handrail system at roof edge as required per codes having jurisdiction. Maintain clearances from handrail system to power panels.
 6. Locate air intakes 25' away from exhaust outlets and plumbing vents for healthcare facilities.
 7. Locate air intakes for kitchen air intakes min 10' away from exhaust outlets and plumbing vents from kitchen exhaust fans.

3.7 CONNECTION TO EXISTING UTILITIES

- A. If connecting to an existing piping system (water, gas, oil, sewer, steam, condensate, etc.). It shall be the responsibility of this contractor to verify the integrity of the piping system being connected. Coordinate all system shutdowns with the owner. All applicable testing and acceptance will apply.
- B. Existing Pipe Testing: The contractor shall remove a section of piping at the point of connection between new and existing. The contractor shall determine the integrity of the existing piping after analysis of the piping section for tube wall thickness, scaling and corrosion. The analysis shall determine the ability for tie-in, pressure testing ability and remaining useful life. The contractor shall guarantee the piping integrity at the point of tie-in and subsequent acceptance. For existing piping not currently being used; the contractor shall pressure test in order to determine integrity and subsequent acceptance. Report all results in writing to the Architect/Engineer.

END OF SECTION

SECTION 22 0517

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe sleeves.

1.02 REFERENCE STANDARDS

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

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Manufacturers:
 - 1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.
 - 2. or approved equal.
- B. Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
 - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
 - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- C. Pipe Passing Through Below Grade Exterior Walls:
 - 1. Zinc coated or cast iron pipe.
 - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

PART 3 EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 - 1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
 - 2. Aboveground Piping:
 - a. Pack solid using mineral fiber complying with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.

- E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION

SECTION 22 0519
METERS AND GAGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Positive displacement meters.
- B. Flow meters.
- C. Pressure gages and pressure gage taps.
- D. Thermometers and thermometer wells.
- E. Static pressure gages.

1.02 REFERENCE STANDARDS

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.
- B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi; 2007.
- C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.
- D. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance; 2012.
- E. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.04 FIELD CONDITIONS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 POSITIVE DISPLACEMENT METERS (LIQUID)

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. FMC Technologies: www.fmctechnologies.com.
 - 3. Venture Measurement, a Danaher Corporation Company: www.venturemeasurement.com.
 - 4. or approved equal.

2.02 LIQUID FLOW METERS

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. McCrometer: www.mccrometer.com.
 - 3. Venture Measurement, a Danaher Company: www.venturemeasurement.com.
 - 4. Veris Industries: www.veris.com.
 - 5. or approved equal.
- B. Calibrated ASME MFC-3M Venturi orifice plate and flanges with valved taps, chart for conversion of differential pressure readings to flow rate, with pressure gauge in case.

2.03 PRESSURE GAGES

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. Moeller Instrument Company, Inc: www.moellerinstrument.com.
 - 3. Omega Engineering, Inc: www.omega.com.
 - 4. or approved equal.
- B. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

1. Case: Steel with brass bourdon tube.
2. Size: 4-1/2 inch (115 mm) diameter.
3. Mid-Scale Accuracy: One percent.
4. Scale: Psi.

2.04 PRESSURE GAGE TAPPINGS

- A. Gage Cock: Tee or lever handle, brass for maximum 150 psi (1034 kPa).
- B. Needle Valve: Brass, 1/4 inch (6 mm) NPT for minimum 150 psi (1034 kPa).

2.05 DIAL THERMOMETERS

- A. Manufacturers:
 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 2. Omega Engineering, Inc: www.omega.com.
 3. Weksler Glass Thermometer Corp: www.wekslerglass.com.
 4. or approved equal.
- B. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
 1. Size: 5 inch (125 mm) diameter dial.
 2. Lens: Clear glass.
 3. Accuracy: 1 percent.
 4. Calibration: Degrees F.

2.06 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

2.07 STATIC PRESSURE GAGES

- A. Manufacturers:
 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 2. Omega Engineering, Inc: www.omega.com.
 3. Veris Industries: www.veris.com.
 4. Weksler Glass Thermometer Corp: www.wekslerglass.com.
 5. or approved equal.
- B. 3-1/2 inch (90 mm) diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install positive displacement meters with isolating valves on inlet and outlet to AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.
- C. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- E. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- F. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

END OF SECTION

SECTION 22 0523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Globe valves.
- D. Ball valves.
- E. Butterfly valves.
- F. Check valves.
- G. Gate valves.
- H. Plug valves.
- I. Chainwheels.

1.02 REFERENCE STANDARDS

- A. API STD 594 - Check Valves: Flanged, Lug Wafer, and Butt-Welding; 2007 (Errata 2010).
- B. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.
- D. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2013.
- E. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2009.
- F. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2013.
- G. ASME B31.9 - Building Services Piping; 2014.
- H. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.
- I. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2012).
- J. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).
- K. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2014).
- L. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
- M. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2015.
- N. AWWA C606 - Grooved and Shouldered Joints; 2015.
- O. MSS SP-67 - Butterfly Valves; 2011.
- P. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 2011.
- Q. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2011.
- R. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010.
- S. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.
- T. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- U. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.
- V. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.
- D. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.04 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Obtain valves for each valve type from single manufacturer.
- B. Welding Materials and Procedures: Conform to ASME BPVC-IX.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Use the following precautions during storage:
 - 1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
 - 2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors in dry environment.
 - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.
- B. Exercise the following precautions for handling:
 - 1. Handle large valves with sling, modified to avoid damage to exposed parts.
 - 2. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:
 - 1. Throttling (Hydronic): Butterfly, Ball, and Globe.
 - 2. Isolation (Shutoff): Butterfly, Gate, Ball, and Plug.
 - 3. Swing Check (Pump Outlet):
 - a. 2 NPS (50 DN) and Smaller: Bronze with bronze disc.
 - b. 2-1/2 NPS (65 DN) and Larger: Iron with lever and weight, lever and spring, or center-guided metal.
- B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.
- C. Required Valve End Connections for Non-Wafer Types:
 - 1. Steel Pipe:
 - a. 2 NPS (50 DN) and Smaller: Threaded ends.
 - b. 2-1/2 NPS (65 DN) and Larger: Grooved ends.
- D. Heating Hot Water Valves:
 - 1. 2 NPS (50 DN) and Smaller, Brass and Bronze Valves:
 - a. Threaded ends.
 - b. Ball: Full port, one piece, brass trim.
 - c. Swing Check: Bronze disc, Class 125.
 - d. Gate: NRS, Class 125.
 - e. Globe: Bronze disc, Class 125.
 - 2. 2-1/2 NPS (65 DN) and Larger, Iron Valves:
 - a. 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Threaded ends.
 - b. Ball: 2-1/2 NPS (65 DN) to 10 NPS (250 DN), Class 150.
 - c. Single-Flange Butterfly: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), aluminum-bronze disc, EPDM seat, 200 CWP.

- d. Grooved-End Butterfly: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), 175 CWP.
- e. Swing Check: Metal seats, Class 125.
- f. Grooved-End Swing Check: 3 NPS (80 DN) to 12 NPS (300 DN), 300 CWP.
- g. Gate: NRS, Class 125.
- h. Globe: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), Class 125.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 - 1. Gear Actuator: Quarter-turn valves 8 NPS (200 DN) and larger.
 - 2. Handwheel: Valves other than quarter-turn types.
 - 3. Wrench: Plug valves with square heads.
 - 4. 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.
- D. Valves in Insulated Piping: Provide 2 NPS (50 DN) stem extensions and the following features:
 - 1. Gate Valves: Rising stem.
 - 2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: Extended neck.
 - 4. Memory Stops: Fully adjustable after insulation is installed.
- E. Memory Stops: Fully adjustable after insulation is installed.
- F. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 - 3. Pipe Flanges and Flanged Fittings 1/2 NPS (15 DN) through 24 NPS (600 DN): ASME B16.5.
 - 4. Grooved End Connections: AWWA C606.
- G. General ASME Compliance:
 - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 - 2. Building Services Piping Valves: ASME B31.9.
- H. Bronze Valves:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE GLOBE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa).
 - 1. Comply with MSS SP-80, Type 1.
 - 2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
 - 3. Ends: Threaded or solder joint.
 - 4. Stem and Disc: Bronze.
 - 5. Packing: Asbestos free.
 - a. Handwheel: Malleable iron.

2.04 IRON GLOBE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa), and Class 250: CWP Rating: 500 psig: (3450 kPa).
 - 1. Comply with MSS SP-85, Type I.
 - 2. Body: Gray iron; ASTM A126, with bolted bonnet.
 - 3. Ends: Flanged.
 - 4. Trim: Bronze.
 - 5. Packing and Gasket: Asbestos free.

6. Operator: Handwheel or chainwheel.

2.05 BRASS BALL VALVES

- A. Two Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig (1035 kPa).
 3. CWP Rating: 600 psig (4140 kPa).
 4. Body: Forged brass.
 5. Ends: Threaded.
 6. Seats: PTFE.
 7. Stem: Stainless Steel.
 8. Ball: Chrome-plated brass.
- B. Three Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig (1035 kPa).
 3. CWP Rating: 600 psig (4140 kPa).
 4. Body: Forged brass.
 5. Ends: Threaded.
 6. Seats: PTFE.
 7. Stem: Stainless steel.

2.06 BRONZE BALL VALVES

- A. Two Piece, Full Port with Bronze or Brass Trim:
1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig (1035 kPa).
 3. CWP Rating: 600 psig (4140 kPa).
 4. Body: Bronze.
 5. Ends: Threaded.
 6. Seats: PTFE .
 7. Stem: Bronze or brass.
- B. Three Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig (1035 kPa).
 3. CWP Rating: 600 psig (4140 kPa).
 4. Body: Bronze.
 5. Ends: Threaded.
 6. Seats: PTFE.
 7. Stem: Stainless steel.

2.07 IRON BALL VALVES

- A. Split Body, Full Port:
1. Comply with MSS SP-72.
 2. CWP Rating: 200 psig (1380 kPa).
 3. Body: ASTM A126, gray iron.
 4. Ends: Flanged.
 5. Seats: PTFE.
 6. Stem: Stainless steel.
 7. Ball: Stainless steel.

2.08 IRON, SINGLE FLANGE BUTTERFLY VALVES

- A. Lug type: Bi-directional dead end service without downstream flange.
1. Comply with MSS SP-67, Type I.
 2. CWP Rating: 150 psig (1035 kPa).
 3. Body Material: ASTM A126 cast iron or ASTM A536 ductile iron.

4. Stem: One or two-piece stainless steel.
5. Seat: NBR.
6. Disc: Coated ductile iron.

2.09 IRON, GROOVED-END BUTTERFLY VALVES

- A. CWP Rating: 175 psig (1200 kPa).
 1. Comply with MSS SP-67, Type I.
 2. Body: Coated ductile iron.
 3. Stem: Stainless steel.
 4. Disc: Coated ductile iron.
 5. Disc Seal: EPDM.

2.10 BRONZE SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa).
 1. Comply with MSS SP-80, Type 3.
 2. Body Design: Horizontal flow.
 3. Body Material: Bronze, ASTM B62.
 4. Ends: Threaded.
 5. Disc: Bronze.

2.11 IRON, FLANGED END SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa) with Metal Seats.
 1. Comply with MSS SP-71, Type I.
 2. Design: Clear or full waterway with flanged ends.
 3. Body: Gray iron with bolted bonnet in accordance with ASTM A126.
 4. Trim: Bronze.
 5. Disc Holder: Bronze.
 6. Gasket: Asbestos free.

2.12 BRONZE GATE VALVES

- A. Rising Stem (RS):
 1. Comply with MSS SP-80, Type I.
 2. Class 125: CWP Rating: 200 psig (1380 kPa).
 3. Body Material: Bronze with integral seat and union-ring bonnet.
 4. Ends: Threaded or solder joint.
 5. Stem: Bronze.
 6. Disc: Solid wedge; bronze.
 7. Packing: Asbestos free.
 8. Handwheel: Malleable iron, bronze, or aluminum.

2.13 IRON GATE VALVES

- A. NRS or OS & Y:
 1. Comply with MSS SP-70, Type I.
 2. Class 125: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), CWP Rating: 200 psig (1380 kPa).
 3. Body Material: Gray iron with bolted bonnet.
 4. Ends: Flanged.
 5. Trim: Bronze.
 6. Disc: Solid wedge.
 7. Packing and Gasket: Asbestos free.

2.14 LUBRICATED PLUG VALVES

- A. Regular Gland and Cylindrical with Threaded Ends:
 1. Comply with MSS SP-78, Type II.
 2. Class 125: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), CWP Rating: 200 psig (1380 kPa).
 3. Body Material: Cast iron with lubrication sealing system.

4. Pattern: Regular or short.
5. Plug: Cast iron or bronze with sealant groove.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1.04 QUALITY ASSURANCE

- A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Metal Channel (Strut) Framing Systems:
 - 1. Comply with MFMA-4.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
- D. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- G. Secure fasteners according to manufacturer's recommended torque settings.
- H. Remove temporary supports.

END OF SECTION

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Stencils.
- E. Pipe markers.
- F. Ceiling tacks.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2016.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Automatic Controls: Tags. Key to control schematic.
- C. Control Panels: Nameplates.
- D. Ductwork: Nameplates.
- E. Major Control Components: Nameplates.
- F. Piping: Tags.
- G. Pumps: Nameplates.
- H. Relays: Tags.
- I. Tanks: Nameplates.
- J. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 NAMEPLATES

- A. Letter Color: White.
- B. Letter Height: 1/4 inch (6 mm).
- C. Background Color: Black.
- D. Plastic: Conform to ASTM D709.

2.03 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.04 ADHESIVE-BACKED DUCT MARKERS

- A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch (0.76 mm); printed with UV and chemical resistant inks.
- B. Style: Individual Label.
- C. Color: Yellow/Black.

2.05 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 - 1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
 - 2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
 - 3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.
 - 4. 8 to 10 inch (200-250 mm) Outside Diameter of Insulation or Pipe: 24 inch (600 mm) long color field, 2-1/2 inch (65 mm) high letters.

2.06 PIPE MARKERS

- A. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- B. Color code as follows:
 - 1. Heating, Cooling, and Boiler Feedwater: Green with white letters.

2.07 CEILING TACKS

- A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install plastic pipe markers in accordance with manufacturer's instructions.
- C. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 22 0719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.
- D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville Corporation: www.jm.com/#sle.
 - 3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com/#sle.
 - 4. or approved equal.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
 - 1. Aeroflex USA, Inc; Aerocel Stay-Seal with Protape (SSPT): www.aeroflexusa.com/#sle.
 - 2. Armacell LLC; AP Armaflex: www.armacell.us/#sle.
 - 3. K-Flex USA LLC; Insul-Tube: www.kflexusa.com/#sle.
 - 4. or approved equal.

- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
 - 3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETS

- A. PVC Plastic.
 - 1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com/#sle.
 - b. or approved equal.
 - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil (0.25 mm).
 - e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.03 SCHEDULES SEE P500

END OF SECTION

SECTION 22 1005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Flanges, unions, and couplings.
 - 4. Pipe hangers and supports.
 - 5. Valves.

1.02 RELATED REQUIREMENTS

- A. Section 22 0719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
- C. ASME B31.9 - Building Services Piping; 2017.
- D. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2020.
- E. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- F. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.
- G. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- H. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- I. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- J. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.
- K. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012 (Reapproved 2018).
- L. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2017.
- M. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015.
- N. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2017 (Revised 2018).
- O. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2012 (Revised 2018).
- P. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.
- Q. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.
- R. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- S. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. PVC Pipe: ASTM D2729.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.

2.04 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 - 1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

2.05 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 - 2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 3. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
 - 4. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
- C. Plumbing Piping - Water:
 - 1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 - 2. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 3. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Concrete Screw Type Anchors: Complying with ICC-ES AC193.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- C. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- D. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.

END OF SECTION

SECTION 22 1006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Water hammer arrestors.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 – Summary.
- B. Section 01 6000 - Product Requirements.
- C. Section 22 1005 - Plumbing Piping.
- D. Section 22 3000 - Plumbing Equipment.
- E. Section 22 4000 - Plumbing Fixtures.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASME A112.6.3 - Floor and Trench Drains; 2019.
- C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2017.
- D. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- E. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- F. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- E. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.
- F. Operation Data: Indicate frequency of treatment required for interceptors.
- G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- H. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors. See Section 01 7800 for closeout submittals.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage. Store in such a way that shall protect from damage following delivery.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

- A. Manufacturers:
 - 1. Substitutions: See Section 01 6000 - Product Requirements.
- B. Floor Drains:
 - 1. Manufacturers:

2.03 CLEANOUTS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company; www.jayrsmith.com/#sle.
 - 2. Josam Company; www.josam.com/#sle.
 - 3. MIFAB, Inc; www.mifab.com/#sle.
 - 4. Zurn Industries, LLC; www.zurn.com/#sle.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.04 WATER HAMMER ARRESTORS

- A. Manufacturers:
 - 1. Cash Acme, a brand of Reliance Worldwide Corporation; www.cashacme.com/#sle.
 - 2. Jay R. Smith Manufacturing Company; www.jayrsmith.com/#sle.
 - 3. Watts Regulator Company, a part of Watts Water Technologies; www.wattsregulator.com/#sle.
 - 4. Zurn Industries, LLC; www.zurn.com/#sle.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Water Hammer Arrestors:
 - 1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.05 FLOOR DRAIN TRAP SEALS

- A. Manufacturers:
 - 1. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, washing machine outlets, or water closets.

END OF SECTION

SECTION 22 4000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Owner-furnished fixtures.
- B. Section 07 9200 - Joint Sealants: Sealing joints between fixtures and walls and floors.
- C. Section 22 1005 - Plumbing Piping.
- D. Section 22 1006 - Plumbing Piping Specialties.
- E. Section 22 3000 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- C. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
- D. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2017).
- E. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018.
- F. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; 1994 (R2009).
- G. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.
- H. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015.
- I. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.
- J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- K. FM (AG) - FM Approval Guide; current edition.
- L. IAPMO Z124 - Plastic Plumbing Fixtures; 2017.
- M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- N. ITS (DIR) - Directory of Listed Products; current edition.
- O. NSF 61 - Drinking Water System Components - Health Effects; 2019.
- P. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- Q. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for installation of plumbing systems.
- B. Comply with UL (DIR) requirements.
- C. Perform work in accordance with local health department regulations.
- D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.03 FLUSH VALVE WATER CLOSETS

- A. Floor Mounted Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
 - 1. Bowl: ASME A112.19.2; 16.5 inches (420 mm) high with elongated rim.
 - 2. Flush Valve: Exposed (top spud).
 - 3. Flush Operation: Manual, oscillating handle.
 - 4. Handle Height: 44 inches (1117 mm) or less.
 - 5. Supply Size: 1 inches (25 mm).
 - 6. Color: White.
 - 7. Manufacturers:
 - a. American Standard, Inc; Madera: www.americanstandard-us.com/#sle.
- B. Wall Hung Water Closets: Vitreous china, ASME A112.19.2, siphon jet flush action, china bolt caps.
 - 1. Bowl: ASME A112.19.2; 16.5 inches (420 mm) high with elongated rim.
 - 2. Flush Valve: Exposed (top spud).
 - 3. Flush Operation: Manual, oscillating handle.
 - 4. Handle Height: 44 inches (1117 mm) or less.
 - 5. Supply Size: 1 inches (25 mm).
 - 6. Color: White.
 - 7. Manufacturers:
 - a. American Standard, Inc; Afton: www.americanstandard-us.com/#sle.
- C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
 - 1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 - 2. Manufacturers:
 - a. American Standard, Inc; FloWise: www.americanstandard-us.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- D. Seats:

1. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com/#sle.
 - b. or approved equal.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, with cover.
- E. Water Closet Carriers:
1. Manufacturers:
 - a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - b. JOSAM Company: www.josam.com/#sle.
 - c. Zurn Industries, Inc: www.zurn.com/#sle.
 - d. Or approved equal.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
 2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.04 WALL HUNG URINALS

- A. Wall Hung Urinal Manufacturers:
1. American Standard, Inc; Washbrook: www.americanstandard-us.com/#sle.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
1. Flush Volume: 1.0 gallons (3.7 liters), maximum.
 2. Flush Valve: Exposed (top spud).
 3. Flush Operation: Manual, oscillating handle.
 4. Trap: Integral.
 5. Supply Size: 3/4 inch (19 mm).
 6. Outlet Size: 2 inches (50 mm).
- C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 2. Manufacturers:
 - a. American Standard, Inc; Ultima: www.americanstandard-us.com/#sle.
- D. Carriers:
1. Manufacturers:
 - a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - b. JOSAM Company: www.josam.com/#sle.
 - c. Viega LLC: www.viega.us/#sle.
 - d. Zurn Industries, Inc: www.zurn.com/#sle.
 - e. Or approved equal.
 - f. Substitutions: See Section 01 6000 - Product Requirements.
 2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.05 LAVATORIES

- A. Lavatory Manufacturers:
1. American Standard, Inc; Lucerne: www.americanstandard-us.com/#sle.
- B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, 20-1/2 by 18 - 1/4 inch (521 by 464 mm) minimum, with 4 inch (100 mm) high back, rectangular basin with splash lip, and front overflow.
1. Drilling Centers: 4 inch (100 mm).
- C. Supply Faucet Manufacturers:
1. American Standard, Inc: www.americanstandard-us.com/#sle.
- D. Metered Faucet: ASME A112.18.1; chrome plated metered mixing faucet with easy-push handles, aerator and cover plate, open grid strainer.

- E. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- F. Accessories:
 - 1. Carrier:
 - a. Manufacturers:
 - 1) Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - 2) JOSAM Company: www.josam.com/#sle.
 - 3) Zurn Industries, Inc: www.zurn.com/#sle.
 - 4) Or approced equal.
 - 5) Substitutions: See Section 01 6000 - Product Requirements.
 - b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Install components level and plumb.
- C. Install and secure fixtures in place with wall carriers and bolts.
- D. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.05 CLEANING

- A. Clean plumbing fixtures and equipment.
- B. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.06 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

3.07 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
 - 1. Water Closet:
 - a. Accessible: 18 inches (455 mm) to top of seat.
 - 2. Water Closet Flush Valves:
 - a. Standard: 11 inches (280 mm) min. above bowl rim.
 - 3. Urinal:
 - a. Accessible: 17 inches (430 mm) to top of bowl rim.
 - 4. Lavatory:
 - a. Accessible: 34 inches (865 mm) to top of basin rim.

END OF SECTION

**SECTION 23 0000
HVAC SCOPE OF WORK**

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Sections, apply to this Section.

1.2 REQUIREMENTS

- A. The conditions as defined in Division 23 – Common Work Results for HVAC, shall apply to all Division 23 specifications.
- B. This contractor shall carefully read the above-mentioned documents and study the drawings of all trades. He shall be responsible for neglect to read or attend to any paragraph or items contained herein.

1.3 INTENT

- A. It is the intent of this specification and accompanying drawings to provide HVAC system, as specified herein and as shown on the contract drawings. The drawings show the general arrangement and extent of the work to be done. Exact location and arrangement of all components shall be determined as the work progresses. Plans are subject to such modification as may be necessary at the time of installation in order to meet construction conditions. Any adjustments shall be made by the HVAC Contractor, without extra charge.
- B. The project is to be completed during normal working hours, or per direction of school district.

1.4 WORK INCLUDED

- A. These specifications and accompanying drawings are intended to cover the furnishing by this Contractor of all labor, material and equipment of every kind necessary for the complete installation of the various systems and such other material and equipment as hereinafter specified and shall not be limited to the following:
 - 1. Provide new air inlets and outlets and associated accessories.
 - 2. Provide exhaust fans, curbs, accessories, and controls.
 - 3. Provide insulation for ductwork, piping, and equipment.
 - 4. Provide direct digital control system including all controls, components and control wiring.
 - 5. Provide all ductwork and piping systems and accessories.
 - 6. Provide all steel supports, vibration isolators, and hangers for all equipment, ductwork and piping.
 - 7. Provide all fire-stopping for your work.
 - 8. Provide installation of direct digital control system utilizing owner furnished equipment and all additional components, control wiring and other required control equipment necessary for a complete code and operable system compliant with the design intent.
 - 9. Provide startup on all equipment by factory authorized personnel.
 - 10. Provide complete testing and balancing of all air and water systems.
 - 11. Provide make up air system and all associated curbs, controls, and accessories.
 - 12. Provide split system air conditioning systems.
 - 13. Provide refrigerant piping systems with fittings, hangers, specialties and equipment.
 - 14. Provide pipe fittings, valves and specialties for hot water heating piping.
 - 15. Provide dampers, turning vanes, louvers and other ductwork accessories for all airside systems.
 - 16. Provide balancing fittings, air vents, unions, strainers, thermometers, pressure gauges and other hydronic accessories for all waterside piping systems.
 - 17. Provide ductwork leakage testing.

18. Provide piping pressure testing.
19. Provide variable frequency drives.
20. Provide air vents, unions, strainers, thermometers and gauges for all piping systems.
21. Provide coil hookup packages with pressure independent control valves for hydronic terminals.
22. Provide fire and smoke dampers where indicated or needed.
23. Setting of sleeves. Provide link seals. Core drilling floors and walls.
24. Provide HVAC Commissioning.

B. The following items of work related to HVAC will be performed by others as follows:

1. The General Contractor shall provide all foundations and pads for equipment, paint all piping in finished areas, provide all base flashing on roof, build in all sleeves, unless otherwise noted.
2. The Plumbing Contractor shall provide floor drains for HVAC equipment. Drainage piping from equipment to drains shall be by the HVAC Contractor.
3. The Electrical Contractor shall do all power wiring for HVAC equipment.

1.5 ADDITIONAL MATERIALS AND INSTALLATION INCLUDED

A. This contractor shall, as part of his base bid, provide the following materials and installations for the complete systems installation.

1. The contractor shall provide one offset for each 20'-0" of run for each piped and ducted service in the building.

B. The contractor shall provide a cost break-down for each of the items listed in paragraph A, above. The cost shall be broken down to indicate material, accessories and labor required for the installation of the items listed above. Upon projected completion, contractor shall submit credit for additional material and installation which is unused.

1.6 WORK AS A SUBCONTRACTOR

A. When the HVAC work is subcontracted, the exact scope of work may be limited or added to at the discretion of the General Contractor/Construction Manager. A subcontractor shall, therefore, verify the extent of his work with the General Contractor/Construction Manager.

1.7 RELATED WORK SPECIFIED ELSEWHERE

The following related work items are included in separate divisions and Sections as follows:

- A. General Requirements, Division 01.
- B. Site Work – Division 31.
- C. Concrete – Division 03.
- D. Painting – Division 09.
- E. Basic Plumbing Requirements – Division 22.
- F. Fire Protection General Requirements – Division 21.
- G. Electrical – Division 26.

PART 2 - PRODUCTS

2.1 As specified in the following related sections.

PART 3 - EXECUTION

3.1 All HVAC systems shall be complete and fully operational.

- A. It is the intent of the Drawings and Specifications and the contractor responsibility is to provide a complete code compliant workable system ready for the Owner's operation. Any item not specifically shown on the Drawings or called for in the Specifications, but normally required to conform to the intent, are to be considered a part of the Contract.

END OF SECTION

SECTION 23 0500
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Sections, apply to this Section.

1.2 EXECUTION OF THE WORK

- A. These specifications call out certain duties of the HVAC Contractor and any Subcontractors. They are not intended as a material list of items required by the Contract. Any reference in these specifications and on the accompanying drawings to the Contractor, Mechanical Contractor, ATC Contractor, Mechanical HVAC Subcontractor, Subcontractor or abbreviation "M.C.", shall be construed to mean the Contractor responsible for all mechanical construction (Division 23) work for this project.
- B. This division of the specifications covers the HVAC systems of the project. It includes work performed by the mechanical trades as well as trades not normally considered as mechanical trades.
- C. Provide all items and work indicated on the Drawings and all items and work called for in this division of the specifications in accordance with the conditions of Contract (Division 01 General Requirements Documents). This includes all incidentals, equipment, appliances services, hoisting, scaffolding, supports, tools supervision, labor consumable items, fees licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to provide fully operable systems.
- D. Comply with all provisions of the Contract Documents including the General Conditions, and Division 01 General Requirements of the specifications.
- E. Certain terms such as "shall, provide, install, complete, start-up" are not used in some parts of these specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.
- F. Examine and compare the HVAC Drawings with these specifications, and report any discrepancies between them to the Architect/Engineer and obtain from him written instructions for changes necessary in the work. At time of bid the most stringent requirements must be included in said bid.
- G. Examine and compare the HVAC Drawings and Specifications with the Drawings and Specifications of other trades, and report any discrepancies between them to the
- a. Architect/Engineer and obtain from him written instructions for changes necessary in the work.
 - b. At time of bid, the most stringent requirements must be included in said bid.
- H. Install and coordinate the HVAC work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interferences in a manner approved by the Architect/Engineer. All changes required in the work of the Contractor, caused by his neglect to do so, shall be made by him at his own expense.
- I. It is the intent of the Drawings and Specifications to provide a complete code compliant workable system ready for the Owner's operation. Any item not specifically shown on the Drawings or called for in the Specifications, but normally required to conform with the intent, are to be considered a part of the Contract.
- J. These specifications are basically equipment, installation, and performance Specifications. Some installation details are indicated on the Drawings. Where these differ from the Specifications, apply the more stringent at time of bid. Upon award of bid, contact Architect/Engineer for definite instructions.

- K. All materials furnished by the Contractor shall be new and unused (temporary services are excluded) and free from defects.
- L. All products and materials shall be new, clean, free of defects and free of damage and corrosion.
- M. The exclusion from, or limitation in, the symbolism used on the Drawings or the language used in the Specifications for HVAC work shall not be interpreted as a reason for omitting the accessories necessary to complete any required system or item of equipment.
- N. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.
- O. All items of equipment or material shall be the product of one manufacturer throughout. Multiple manufacturers will not be permitted.
- P. Receive, inspect, store and install Owner-furnished equipment where Owner furnished equipment is supplied.

1.3 COORDINATION OF THE WORK

- A. Certain materials will be provided by other trades. Examine the Contract Documents to ascertain these requirements.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. No items foreign to the electrical system shall be run in the dedicated space of the electrical equipment. Dedicated space shall be defined as the width and depth of the equipment from the floor to the bottom of the structural ceiling. Foreign systems include but are not limited to piping, sprinklers, drip trays, etc. Contractor shall be responsible to coordinate the locations of the dedicated spaces with electrical and other trades as required.
- D. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- E. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
- F. Due to the type of installation, a fixed sequence of operation is required to properly install the complete systems. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- G. The locations of piping, control panels, and other equipment indicated on the Drawings are approximately correct, but they are understood to be subject to such revision as may be found necessary or desirable at the time the work is installed in consequence of increase or reduction of the number of outlets, or in order to meet field conditions or to coordinate with modular requirements of ceilings, or to simplify the work, or for other legitimate causes.
- H. The Drawings show only the general run of piping and approximate location of termination. Any significant changes in location of routing, necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.

- I. Wherever the work is of sufficient complexity, prepare additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work shall be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field.
- J. Contractor shall furnish services of an experienced Superintendent, who shall be in constant charge of all work, and who shall coordinate his work with the work of other trades. No work shall be installed before coordinating with other trades.
- K. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
- L. Where service connections are required, to equipment provided by the Owner or by other trades, this Contractor shall verify the exact requirements for these connections prior to ordering any materials or laying out any work. Where there is a discrepancy between the equipment being furnished and that shown on the Contract Drawings, the Contractor shall notify the Architect/Engineer for direction. Failure to comply with this coordination shall not constitute a reason for extra monies for equipment ordered or installed. Restocking charges will not be paid.

1.4 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.5 SUMMARY

- A. This section includes the general requirements that apply to the Mechanical and HVAC Contractor. Fire Protection and the Controls Contractor or Sub-Contractor.
- B. The following work is specified under other Divisions, unless otherwise noted or specified hereinafter:
 - 1. Site Work, Divisions 31, 32 and 33.
 - 2. Concrete, Division 03.
 - 3. Roof, Division 07.
 - 4. Plumbing, Division 22.
 - 5. Electrical, Division 26.
 - 6. Installation of starters, contactors, thermal overload switches and remote push buttons, and connection of power wiring to motors, Division 26.

1.6 INTENT

- A. Requirements specified herein shall govern applicable portions of Heating, Ventilation and Air Conditioning.
- B. It is the intent of this specification and accompanying drawings to describe and indicate the general manufacture, erection and installation of the equipment and connection to same specified herein and shown on the drawings. It is not intended that the specifications and drawings describe and indicate each piece of equipment required for installation, for where items are intended or required for satisfactory installation and are considered to be the accepted practice of the trade, they shall be considered to be both specified and indicated. Drawings are diagrammatic in nature; for piping systems; water piping is tapped off the bottom of the pipe and steam and steam condensate piping is tapped off the top of the pipe; provide all tees, elbows and swing joints as required for hookup to coils or branch piping as required for this work whether they are indicated on the drawings or not.

- C. It shall be understood that the Contractor as hereinafter mentioned shall be the Mechanical Contractor unless specifically noted otherwise.
- D. The Contractor shall furnish all plant, labor and material necessary for the complete and satisfactory installation of all Mechanical work for this contract.
- E. The Contractor shall assume the entire responsibility for the materials, workmanship and satisfactory operation of the various mechanical systems, and other work as specified herein and/or as shown on the drawings.
- F. The Contractor shall schedule and coordinate all work in close cooperation with all trades working on this project.

1.7 DEFINITIONS

- A. Following definition of terms and expressions used in this section are in addition to listing given in Supplementary Conditions:
 - 1. "Provide" shall mean "furnish and install" unless otherwise indicated.
 - 2. "Herein" shall mean the contents of a particular section where this term appears.
 - 3. "Indicated" shall mean "Indicated on contract drawings".
 - 4. 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, crawl spaces, and tunnels.
 - 5. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
 - 6. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
 - 7. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
 - 8. 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.
 - 9. The following are industry abbreviations for plastic materials:
 - a. ABS: Acrylonitrile-butadiene-styrene plastic
 - b. CPVC: Chlorinated polyvinyl chloride plastic
 - c. NP: Nylon plastic
 - d. PE: Polyethylene plastic
 - e. PVC: Polyvinyl chloride plastic

1.8 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for establishing grades and elevations, and checking of all interferences, and shall verify all dimensions and locations in the field.
- B. Contract drawings for mechanical work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement of equipment, ducts, piping and approximate sizes and locations of equipment outlets. Mechanical trades shall follow these drawings in layout of their work, consult general construction, structural and electrical drawings to familiarize themselves with all conditions affecting their work, and shall verify spaces in which their work will be installed.
- C. The Contractor shall verify with the A/E before bidding any item of piping or piping arrangement which may be incomplete, incorrect or indefinite. After contract is let, the A/E's decision shall be final.

- D. All trades shall cooperate and confer with each other as to locations of their materials and equipment before erecting work, so as to avoid interference as much as possible, and in such a manner that will in no way retard progress of construction. In instances where interferences develop, the contractor shall relocate the work as required by the A/E regardless of which work was installed first.
- E. Where job conditions require reasonable changes to indicate locations and arrangement, make such changes without extra cost to Owner. This is not to be construed to permit redesigning of the various systems.
- F. Additional and supplementary drawings may, from time to time, be furnished, and the same, when made, are to constitute a part of the original contract. These drawings will be made to clarify the contract drawings and will not depart materially therefrom.
- G. The A/E specifically reserves the right, up to the time of roughing-in, to exactly define the position of the equipment to be installed and connected to and arrangement of these connections.
- H. Special attention is called to the contract drawings and specifications involving general construction, electrical work and details thereon. Bidders are notified to carefully scrutinize these documents for the details affecting the performance of the mechanical trades.

1.9 SCHEDULE OF WORK

- A. The Contractor shall schedule all of his work to conform to the Job Progress Schedule as submitted by the General Contractor or Construction Manager, and approved by the A/E and school district.

1.10 PREMIUM TIME WORK

- A. The following work shall be performed at night or weekends other than holiday weekends, as directed and coordinated with the Owner:
 - 1. Tie connections to all existing systems.

1.11 PROGRESS OF WORK

- A. The Contractor shall order the progress of his work so as to conform to the progress of the work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the Contractor.

1.12 DELIVERY, STORAGE, PROTECTION AND HANDLING

- A. Deliver, store, protect and handle all products and materials in a manner which will protect them from damage, weather and entry of debris. If items are damaged, do not install, but take immediate steps to obtain replacement or repair. Any such repairs shall be subject to review and acceptance of the Architect/Engineer.
- B. Delivery of Materials: Delivery materials in manufacturer's unopened container fully identified with manufacturer's name, trade name, type, class, grade, size and color.
- C. Storage of Materials, Equipment and Fixtures: Store materials suitably sheltered from the elements, but readily accessibly for inspection by the Architect/Engineer until installed. Store all items, susceptible to moisture damage, in dry, heated spaces.
- D. Protect materials and equipment according to the manufacturer's instruction. Protection shall include damage due to fire, water, rust, oxidation, sunlight (for UV sensitive materials), breakage of UV lights, etc.

E. Following is in addition to Protection of Work and Property, General Requirements:

1. Responsibility for care and protection of mechanical work rests with the Contractor until it has been tested and accepted.
2. After delivery, before, during and after installation, protect equipment and materials against theft, injury and damage from all causes.
3. Protective covers, skids, plugs, caps and coating shall be provided to protect equipment materials from damage during construction.
4. All equipment and material shall be stored under cover and off the ground.
5. For outdoor storage, protective covers of sheet plastic shall be provided. Covers shall be of gauge required for the area involved and shall be reinforced to withstand wind, rain, sleet and snow. Equipment and material shall be set on skids or platforms of sufficient height to avoid deterioration from spattering and ground water.
6. Plug open ends of pipes when work is stopped to prevent debris from entering the pipes.
7. Coat polished or plated metal parts with Vaseline immediately after installation.

F. The Contractor shall receive, properly house, handle, hoist, and deliver to proper location, equipment and other materials required for the contract.

G. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

1.13 INTERFERENCE WITH THE OWNER'S NORMAL OPERATION

- A. All work shall be performed in such a manner as not to interfere with the normal work operations in adjacent spaces or buildings.
- B. In no way shall the Contractor:
1. Block or restrict the means of egress for adjacent spaces.
 2. Decrease the fire rating of walls, partitions, ceilings, doors or combination thereof of adjacent spaces or of means of egress.
 3. Interrupt safety systems or in any way adversely affect the safety of people or materials in adjacent spaces.
- C. The Contractor shall provide acoustical isolation of the work area via temporary doors, partitions, etc., adequate to allow normal work functions.
- D. The Contractor shall provide exhaust fans, dust proof temporary partitions and any containment measure required to prevent dirt, dust, or fumes from reaching adjacent work spaces.
- E. All personal traffic and material delivery shall be routed so as to absolutely minimize travel through adjacent work area.

1.14 VISIT TO SITE

- A. The Contractor shall visit the site and thoroughly acquaint himself with all existing conditions relative to type and source of service available. He shall verify location and extent of these services and consider routing, interferences and excavation required by the contract and any and all other difficulties that may be encountered.
- B. Submission of a proposal shall be construed as evidence that such an examination has been made.
- C. Failure to visit the site shall not constitute sufficient reason to warrant claims for extra monies for difficulties not apparent in the contract documents.

1.15 MANNING THE PROJECT

- A. The Contractor shall, upon initiation of construction, keep a suitable force of men on the site at all times in order to lace all sleeves, inserts, outlet boxes, fixtures and provide all other openings as are required for the satisfactory installation of equipment.

1.16 FEES AND PERMITS

- A. The Contractor shall secure all permits and pay all fees, required by local and state governing bodies, necessary to complete his phase of the construction. Failure to investigate all applicable payments before the bid submission shall not constitute grounds for additional monies from the Owner. The Owner shall be furnished with all certificates of approval.
- B. The Contractor shall provide insurance and bonding as required by the Building Owner or as stated in the General Conditions.

1.17 CODES AND STANDARDS

- A. The design, construction and installation of all materials and equipment shall be in compliance with the latest edition of all national, state and local codes or standards.
- B. The codes and standards referred to are minimum standards. Where the requirements of these specifications and the accompanying drawings exceed those of the codes and standards, the drawings and specifications shall be followed.

1.18 BASIS OF DESIGN

- A. The layout is based upon the use of particular items of equipment, identified by manufacturer's make and model number. Dimensions, arrangements and service connections required for these particular items have been considered in making the layout. The contractor may use the equipment of any manufacturer whose name is approved for substitution on that item of equipment after he had ascertained that all provisions of MATERIAL SUBSTITUTIONS will be complied with and that all required service connections will be made at no additional cost to the Owner.
- B. Manufacturers are listed for a quality assurance level only. Although a manufacturer is listed does not constitute compliance with the specification size, weight, functionality, capacity, noise, or performance levels. It is this contractor's responsibility to assure the proposed manufacturer has complete compliance with the Contract Documents, **prior to bidding**.
- C. Except where dimensions are shown, the drawings are diagrammatic and shall not be scaled. Exact location of fixtures, apparatus, duct work and piping shall be determined by dimensions on the site. Contractor shall refer to architectural plans and details for exact dimensions.
- D. The drawings indicate the locations of apparatus and piping shall be followed as closely as possible. If before the installation it is found necessary to change the location to accommodate conditions at the building, such changes shall be made at no additional cost to the Owner, and as approved by the Architect/Engineer.
- E. Equipment requiring operation, service or maintenance during the life of the system shall be made easily accessible.
- F. Ductwork or piping shall not be run within 48" of switchboards, panelboards or motor control centers.

- G. No piping to other HVAC items shall be run in the dedicated equipment space as defined in the N.E.C. (NFPA 70). The dedicated equipment space is the space equal to the width and depth of the equipment and extending from the floor to a height of 6ft. Refer to the National Electrical Code section 11 0. 26 (E) for further information. No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone. It is this contractor's responsibility to coordinate with the electrical contractor for all phases of this project.
- H. Use of open-flame devices in work shall be accompanied by fire extinguishing apparatus within 25 feet of work location. All work shall be done in accordance with the general construction requirements and fire watch procedures.

1.19 QUALITY OF MATERIALS

- A. Where a specific model and manufacturer of equipment is specified, the Contractor shall provide what is specified without substitution. Where specified as "or approved equal", the Contractor may substitute equipment except that the burden is upon the Bidder to prove such equality. If the Bidder elects to prove such equality, he must request the Architect's approval in writing to substitute such item for the specified item, stating the cost difference involved with supporting data, and samples, if required, to permit a fair evaluation of the proposed substitute with respect to quality, serviceability, warranty and cost.
- B. Where a specific model of equipment is specified along with an approval equal manufacturer, no substitution will be allowed. The Contractor shall submit one of the manufacturers listed.
- C. Final approval of competitive equipment is reserved by the Engineer when, in the Engineer's opinion, the equipment does not correspond to that specified.

1.20 MATERIAL SUBSTITUTIONS

- A. Material substitutions shall be allowed only where "or equivalent" is stated.
- B. Material substitution submittals shall, include complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance, test data and evidence that the proposed manufacturer or his established representative maintains a qualified service organization including spare parts and is available for competent service on short notice.
- C. Each bidder by submitting his bid represents that the proposal of such article, device, product, material, fixture, form or type of construction by name, make, catalog number of manufacturer which varies with the equipment specified shall be incorporated into the project without claims against the Owner for additional cost. The bidder shall be responsible for all additional costs incurred by others due to the substitutions.
- D. The Architect/Engineer shall have the final approval of all submitted substitutions.
- E. Manufacturers are listed for a quality assurance level only. Although a manufacturer is listed does not constitute compliance with the specification size, weight, functionality, capacity, noise, or performance levels. It is this contractor's responsibility to assure the proposed manufacturer has complete compliance with the Contract Documents, **prior to bidding**.

1.21 SUBMITTALS

- A. Product Data, Shop Drawings: Submit for approval by the authority having jurisdiction and the Owner's insurance underwriter.
- B. Product Shop Drawing Submittal List:

1. Within thirty (30) days after date of execution of the Owner/Contractor Agreement, submit for review and acceptance, a list of all material and equipment manufacturers whose products are proposed, as well as names of all subcontractors whom this trade proposes to employ.
 2. Any requests for substitutions of equipment or materials must be submitted and returned prior to submitting the Submittal List. Only specified or accepted manufacturers or suppliers shall appear on the Submittal List.
 3. The complete Submittal List must be reviewed and accepted by the Architect/Engineer prior to submittal of Shop Drawings. No Shop Drawings will be processed without an accepted Submittal List.
 4. The Submittal List shall include all material, systems, and equipment specified herein.
- C. Approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.
- D. All submittals shall bear a stamp or notation indicating that the Contractor has reviewed and approved the submittals.
- E. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and shall clearly identify equipment being submitted.
- F. Submittals shall be marked to show specification reference including the section and paragraph numbers.
- G. Submit each section separately and include the following:
1. Information which confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
 2. Submittals on all pumps and fans shall be complete with performance curves marked with the design points.
 3. Submittals on electrical equipment shall be complete with all power and control wiring diagrams.
 4. Vibration isolators shall include operating weight and load distribution at each mounting point.
- H. The Contractor agrees that failure of manufacturer's submittal to conform to the above will result in a manufacturer's disqualification on this project.
- I. Submit samples as directed of items called for in the specifications; samples of the materials which the manufacturer will actually ship shall be submitted for approval after award of contract and properly labeled on this project.

1.22 ELECTRICAL

A. Power Wiring

1. For the purpose of this specification, power wiring shall be defined as follows:
 - a. All wiring from the power source panelboards (or switchboard) to the disconnect switch to the equipment, and final connection to the equipment.
 - b. All wiring to control panels as indicated in the Electrical and Mechanical Contract Documents. (All control panels not indicated on the Electrical Contract Documents as receiving power shall do so by jumpers from other control panels, this wiring shall be considered control wiring as defined below).
2. All power wiring from the power source to the above noted switches and wiring from these switches to the equipment, including final connection to same, shall be provided under Division 26, Electrical.

B. Control Wiring

1. All other wiring required, whether line voltage or low voltage, internal or external to provide for the operation of the equipment shall be considered as control wiring. This shall include power wiring from transformers serving dampers at exhaust fans; wire to damper and fan end switch to starter.
2. All control wiring throughout the building, including wiring installed at piping, in ductwork, or as specified shall be provided under this Division.

- C. The Contractor shall furnish all motors, mounts, motor starters and remote mounted push-button controls for all electrically operated equipment furnished as part of the contract. The Contractor shall furnish all safety disconnects. The Contractor shall furnish all speed control switches for all multi-speed motors. All motors shall have copper windings. (Aluminum windings will not be acceptable).
- D. This Contractor is completely responsible for the coordination with all other trades as to the correct voltage for all equipment requiring power. Equipment and or changes required to meet the project voltages will be the responsibility of this contractor.
- E. All push-button switches and starters shall be mounted under Division 26, Electrical.
- F. The Contractor shall provide all controls and control devices, all mounting for controls and all other electrical devices as specified and necessary for the complete installation and satisfactory operation of all electrically operated controls furnished under this Division.
- G. All locally mounted starters shall be furnished under Division 23, except as noted below. Where indicated hereinafter, starters shall be furnished as an integral part of equipment. Starters furnished in motor control centers shall be provided in Division 26, Electrical (refer to Electrical Drawings). Control of starters in motor control centers feeding mechanical equipment shall be provided under Division 23.
- H. Starting equipment of each motor shall be of the proper voltage and HP rated for the motor it is to serve. All starters shall be of the enclosed type; NEMA Type 1, for general-purpose enclosures; NEMA Type 4 for watertight enclosures, and NEMA Type 12 for the dust-tight enclosures. Location of motor shall determine type of enclosure to be used.
- I. Manual motor starters for single-phase motors shall be one or two poles as required, consisting of a snap switch combined with a thermal overload device. It shall be impossible for the switch to be held in a closed position under a sustained motor overload. For resetting the overload mechanism, the switch lever shall be of a design where it has to be moved to the "off" position. Starter shall be enclosed in type of enclosure for area in which it is to be used.
- J. Magnetic starters for 3-phase motors shall be furnished with 110 volt holding coils, 120 volt fused transformers, normally open and normally closed auxiliary contact and overload relay heater elements in all three phases. Provide hand/off/auto selector switch along with running status lights and external reset button.
- K. Locate starters and associated starter controls in accessible locations wherever possible. Location of starters for roof mounted exhaust fans and mechanical equipment above ceilings shall be located at accessible locations above ceiling. Locations shall be coordinated with furniture and equipment layouts for the optimum accessible location for installation and maintenance means.
- L. The Contractor shall be completely responsible for the coordination of automatic temperature control system with control interlocks between various items of mechanical equipment.

1.23 SCAFFOLDING

- A. The Contractor shall furnish and install scaffolding, ladders and runways required in connection with his work.

1.24 TEMPORARY OPENINGS

- A. Temporary openings not indicated, which may be required for purpose of bringing equipment into building, shall be as approved. General Contractor will perform work of providing and maintaining openings, and of restoring structure; but Contractor for whom temporary openings are provided shall bear costs thereof, and for restoring structure. Ample notice shall be given of size and location of such openings by Contractor requiring same.
- B. Holes provided in General Construction work to permit installation of lines for temporary mechanical services will, after removal of such lines, be patched as specified under Division 01.

1.25 TEMPORARY SERVICE

- A. Temporary services are specified under Division 01, "General Requirements".

1.26 CUTTING AND PATCHING

- A. The Contractor shall provide all floor and wall cuts as required for ductwork and piping penetrations of existing construction.
- B. No cutting of bearing walls, beams, etc., shall be done without the approval of the Architect. All patching and finishing, etc., shall match the surroundings. All cutting and patching shall be done by workmen skilled in the trades and in the employ of the General Contractor for the project. All cutting shall be done with saw type edges to give a neat and workmanlike appearance. All pipe holes shall be core drilled unless specified otherwise.
- C. Should it be necessary to do any cutting and patching due to the failure of this Contractor to give proper information to the General Contractor, it shall be done at the expense of the Mechanical Contractor.

1.27 PAINTING AND FINISHING

- A. Except as specified herein, the finished painting of Mechanical Work within the building and on the roof shall be as specified under Division 09.
- B. All mechanical equipment shall have a factory-applied prime and finish coat of paint. Galvanized surfaces shall be considered as finished surfaces for equipment rooms and items concealed from view. Plastic products shall be acceptable without a finish coat of paint. All items of equipment marred or rusted, even though factory finished, shall be repainted; steel angles and steel supports for ductwork, piping or miscellaneous equipment shall have a prime coat of paint before installation.
- C. General Contractor to paint all exposed piping, equipment, and trim that does not have a factory applied finish. Refer to Division 09 "Painting" for paint materials, surface preparation and application of paint. Paint shall be semi-gloss, acrylic-enamel paint. Coat components with two (2) coats of finish paint over two (2) coats of rust inhibitive metal primer or approved equivalent based on component type.

1.28 CONCRETE WORK

- A. Concrete work shall be in accordance with Division 03.

1.29 SUSPENSION SUPPORT FOR PIPES & EQUIPMENT

- A. All pipes and equipment that are suspended shall be connected directly to the building steel. Where hangers are required between building steel points, supplementary steel members shall be added by the Contractor as required to adequately support the load.

- B. Pipes shall not be supported from other pipes, ducts, or equipment.
- C. Hangers from joists shall be attached at the panel points. Pipes with weights of 50 pound per foot (total for single or multiple runs) routed parallel with bar joists shall be supported from a minimum of 3 joists at each hanger point (channel members between joists).

1.30 ACCESS PANELS – BUILDING

- A. Access plates and valves located concealed in walls or above ceilings, and are otherwise inaccessible shall be furnished with an access panel for each location. A hinged inconspicuous type access panel complete with frame, of such size and so located as to provide proper access for service and maintenance.
- B. The minimum size of each access panel shall be 18" x 18" unless physical restraints require a smaller door.
- C. Panels shall be furnished under this Division and installed under another Division of the Specification.
- D. When access panels or doors are installed in fire rated construction, they shall be fire rated to match the construction.

1.31 FIRESTOP PENETRATION PROTECTION SEALING SYSTEM

- A. Where pipes pass through fire partitions, firewalls, floors or ceilings, install a firestop that provides an effective barrier against the spread of fire, smoke, gases and water. Fire-stop material shall be packed tight, and completely fill clearances between pipe, sleeves and structure. All crack voids or holes (up to 4" diameter) shall be sealed using 3M brand Fire Barrier Caulk CP25 or putty 303 or an approved equal. Larger diameter or square holes, 3M system 7902, 7904, 7902R or 7904R or approved equal shall be in accordance with manufacturer's instructions.
- B. Fire-stopping material shall maintain its integrity while preventing the passage of flame, smoke, gases or water. Fire-stopping material shall be a one-part, intumescent elastomer noncombustible, noncorrosive and compatible with synthetic cable jackets as defined by ASTM E814 (UL 1479); and in addition for insulation materials, melting points shall be a minimum of 1700 degrees F for one-hour protection and 1850 degrees F for 2-hour protection.

1.32 RECORD DRAWINGS

- A. The Contractor shall furnish record as-built drawings to the Architect at completion and acceptance of the job. Transparencies of the original drawings with corrections shall be submitted as specified in the General Requirements.
- B. Record all changes from installation originally indicated. Record final location of underground lines by depth from finished grade and by offset distances in feet and tenths to surface improvement such as buildings, curb, or edges of walks. Where work appears on two or more drawings, Contractor shall mark changes on all drawings. Contractor shall mark changes on all drawings. At completion, furnish the above required transparencies to the A/E for approval and record. Drawings shall be certified to be record of work installed and signed by the Contractor. Work shall not be accepted until such drawings have been delivered to the A/E.

1.33 GUARANTEE

- A. In addition to the requirements stated in the specifications, the Contractor must guarantee all equipment, materials, and appurtenances installed by him to be free from all defects for a period of one year from date of final acceptance.

- B. Upon written notice from the A/E, the Contractor shall promptly correct all defects without additional cost to the Owner. This Contractor shall adjust each part of the entire installation for proper working order. Reports are to be submitted to the A/E and adjustments repeated until the entire system is satisfactory. This Contractor must make good, at his own expense, any defects in materials or workmanship that may appear.

1.34 CLEAN UP

- A. The Contractor shall be held responsible for the general clean up of all areas affected by the work in the Contract. All rubbish and accumulative material shall be removed from the premises and the premises left "broom clean" upon completion.
- B. All stickers, rust, stains, labels and temporary covers shall be removed before final acceptance.
- C. Foreign matter shall be blown, vacuumed or flushed out of piping, pumps, fans, motors, devices, switches, panels, duct work and equipment.
- D. Identification plates on equipment shall be free of excess paint and shall be polished.

1.35 OPERATION AND MAINTENANCE MANUALS

- A. Submit to the Engineer for approval three manuals covering details of operation maintenance for all apparatus requiring service. The Contractor shall arrange formal instruction sessions by competent representatives of the manufacturer for the Owner's operating personnel to cover the following:
 - 1. Service telephone number, fax number, websites, email addresses, business and service addresses and mobile telephone numbers of the installing contractor, and manufacturer and supplier and parts counters of pumps, fans, air handling units, condensate return units, chillers, CV boxes, fan coil units and other components comprising the systems.
 - 2. Manufacturer's operating and maintenance manuals, including detailed parts lists with numbers, power and control wiring diagrams for each piece of equipment and accessory requiring services or maintenance, the guarantee period and the name, address and phone number of the nearest sales and service organization for each item. Both on print and CD's (min 3 copies) form (PDF/MS Word).
 - 3. Cross out options that are not used on equipment sheets, highlight options selected.
 - 4. Step-by-step procedure for starting, stopping, setpoint adjustment, monitoring and alarm enunciation for each system.
 - 5. Copies of inspection certificates provided by the City, County, State and insurance companies.
 - 6. Provide separate Operation and Maintenance Manuals covering the FMCS and in compliance with this section.
 - 7. Routine maintenance procedures and scheduling for all mechanical equipment.
- B. Obtain written statements from the Owner's representative acknowledging satisfactory completion of each item of the manuals.

1.36 INSTRUCTION TO OPERATIONAL PERSONNEL

- A. Furnish the services of competent instructors to give full instruction to the designated Facilities personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system on the Contract Documents. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.
- B. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation. Provide 4 man-hours of instruction for each: chemical treatment/glycol systems, pumps, exhaust and intake fans, heat exchangers, CV boxes, fan coil units, condensate return units; 8 man-hours for the AH-1 air handling unit and components including the UV system, 24 man hours for the CH-1 chiller; and 40 man hours instruction for the FMCS (operational,

maintenance, programming instruction for trend logging and charting, setpoint adjustment schemes, alarm functionality and other routine operational commands/functions) required by the Owner's personnel..

- C. Instruction shall cover routine maintenance, control and power wiring diagrams and component analysis, preventative maintenance and scheduling, starting and stopping, alarm resets, trend-logging, setpoint adjustment, emergency and normal shutdown/startup, alarm date stamping and all else required by the Owner for complete usage/maintenance/adjustment of equipment in their intended systems.
- D. Obtain written statements from the Owner's representative acknowledging satisfactory completion of each item of instructions.

PART 2 - PRODUCTS

2.1 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Acceptable Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Accepted substitute in accordance with Section 01 6000.
 - 2. Sealing Elements: EPDM interlocking inks, shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Carbon steel. Include two for each sealing element.
- B. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.2 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239 inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. 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 set screws.

2.3 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.

- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.
- E. One-Piece, Stamped-Steel Type: With and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With hinge and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.4 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000 psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify, by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments, that all materials and accessories to be installed on the project comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PROJECT MANAGEMENT AND COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specification to ensure efficient and orderly installation of each part of the work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
 1. Preparation of Contractor's Construction Schedule
 2. Preparation of the Schedule of Values
 3. Installation and removal of temporary facilities and controls
 4. Delivery and processing of submittals
 5. Progress meetings
 6. Pre-installation conferences
 7. Project closeout activities
 8. Startup and adjustment of systems
 9. Project closeout activities
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 1. Salvage materials and equipment involved in performance of, but not actually incorporated into the work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

3.3 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequenced.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Number of Copies: Submit three opaque copies of each submittal. Architect, through Construction Manager, will return one copy.
 - a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect and Construction Manager will retain two copies; remainder will be returned. Markup and retain one returned copy as a Project Record Drawing.
 3. Refer to individual Sections for Coordination Drawing requirements for work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project Site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

3.4 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project Superintendent, provide other administrative and supervisory personnel as required for proper performance of the work.

3.5 PROJECT MEETINGS

- A. General: Attend meetings and conferences at Project Site, unless otherwise indicated.
- B. Preconstruction Conference: Attend a preconstruction conference before starting construction, at a time convenient to Owner, Construction Manager, and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
- C. Pre-installation Conferences: Attend a pre-installation conference at Project Site before each construction activity that requires coordination with other construction.
 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Construction Manager of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents
 - b. Deliveries
 - c. Review of mockups
 - d. Possible conflicts
 - e. Time schedules
 - f. Manufacturer's written recommendations
 - g. Acceptability of substrates
 - h. Temporary facilities and controls
 - i. Coordination with other work
 - j. Protection of construction and personnel
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Attend progress meetings at biweekly intervals. Coordinate dates of meetings with preparation of payment requests.
 1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All

- participants at the conference shall be familiar with Project and authorized to conclude matters relating to the work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 1. Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 1. Interface requirements
 2. Status of submittals
 3. Off-site fabrication
 4. Site utilization
 5. Hazards and risks
 6. Progress cleaning
 7. Status of correction of deficient items
 8. Requests for interpretations (RFIs)
 9. Status of proposal requests
 10. Pending changes
 11. Status of Change Orders
 12. Pending claims and disputes
 13. Documentation of information for payment requests
 3. Minutes: Record the meeting minutes.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

3.6 EQUIPMENT LOCATIONS

- A. Equipment locations: All mechanical equipment shall be located to provide for manufacturer's recommended clearances, clearance for routine maintenance, clearance per code requirements and locations/clearances required for removal/replacement in the future.
 1. Manufacturer's recommended clearances shall include space for clearance for pumps (18" minimum around pumps), 30" clearance or complete access door swings, clearances for tube pulls (heat exchangers, etc.); locate piping to be clear of these locations.
 2. Provide minimum 36" clearance around heat exchangers and other pressure vessels; note this is a minimum requirement, provide excess wherever possible. Provide minimum 42" clearance from power panels per the latest edition NEC having jurisdiction; include requirements for piping and ductwork at such locations.
 3. Locate equipment in mechanical rooms to allow for future removal and replacement. Include heights to overhead piping where applicable. Wherever possible, clearances shall include removal/replacement as a whole entity without knock-down.

4. Locate roof mounted equipment minimum 10' away from edges of roof. Where equipment is located closer, provide handrail system at roof edge as required per codes having jurisdiction. Maintain clearances from handrail system to power panels.

3.7 ACCEPTANCE TESTING

- A. An acceptance test of the HVAC system shall be performed by the Contractor in the presence of the Owner's representative and the Local Fire Marshal. Upon completion of the successful test, the Contractor shall so certify in writing to the Owner and General Contractor.
- B. The Contractor shall also utilize all sub-contractors such as balancing, piping, controls and commissioning agent, and other contractors such as electrical, plumbing, fire alarm and communications as required to perform this acceptance test.
- C. The acceptance test shall be performed to determine that the protective measures required as outlined in NFPA 90A and shall function when needed in order to restrict the spread of fire and smoke.
- D. The acceptance test shall include testing the HVAC system to determine its full functionability and in compliance with NFPA 90A and the sequence of operation. All controls and equipment shall be modulated throughout their entire ranges and adjustments shall be made for optimum performance.
 1. Portions of control or alarm systems are permitted to have standby power or other emergency modes of operation.
 2. The tests shall be performed to determine that the system operates under the standby power or emergency operation mode as well as under normal conditions.

3.8 CONNECTION TO EXISTING UTILITIES

- A. If connecting to an existing piping system (water, gas, steam, condensate, etc.). It shall be the responsibility of this contractor to verify the integrity of the existing piping system being connected. All applicable testing and acceptance will apply.
- B. Existing Pipe Testing: The contractor shall remove a section of piping at the point of connection between new and existing. The contractor shall determine the integrity of the existing piping after analysis of the piping section for tube wall thickness, scaling and corrosion. The analysis shall determine the ability for tie-in, pressure testing ability and remaining useful life. The contractor shall guarantee the piping integrity at the point of tie-in and subsequent acceptance. For existing piping not currently being used; the contractor shall pressure test in order to determine integrity and subsequent acceptance. Report all results in writing to the Architect/Engineer.

3.9 PIPING SYSTEMS – COMMON REQUIREMENTS

- A. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern type.
 - b. Chrome Plated Piping: One piece, cast brass type with polished chrome plated finish.
 - c. Insulated Piping: One piece, stamped steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass type with polished chrome plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, stamped steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Cast brass type with polished chrome plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: Set screw.

- h. Bare Piping in Unfinished Service Spaces: One piece, cast brass type with finish.
 - i. Bare Piping in Unfinished Service Spaces: One piece, stamped steel type with hinge.
 - j. Bare Piping in Equipment Rooms: One piece, cast brass type.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped steel type.
- 1. Bare Piping at Floor Penetrations in Equipment Rooms: One piece, floor plate type.
 - 2. Existing Piping: Use the following:
 - a. Chrome Plated Piping: Split casting, cast brass type with chrome plated finish.
 - b. Insulated Piping: Split plate, stamped steel type with hinge and spring clips.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast brass type with chrome plated finish.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split plate, stamped steel type with concealed hinge and spring clips.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split casting, cast brass type with chrome plated finish.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split plate, stamped steel type with concealed hinge and set screw.
 - g. Bare Piping in Unfinished Service Spaces: Split casting, cast brass type with finish.
 - h. Bare Piping in Unfinished Service Spaces: Split plate, stamped steel type with hinge and set screw or spring clips.
 - i. Bare Piping in Equipment Rooms: Split casting, cast brass type.
 - j. Bare Piping in Equipment Rooms: Split plate, stamped steel type with set screw or spring clips.
 - k. Bare Piping at Floor Penetrations in Equipment Rooms: Split casting, floor plate type.
- B. Sleeves are not required for core drilled holes, ***except in mechanical and electrical rooms or other wet areas where sleeves shall extend 2 inches above finished floor and shall be made watertight.***
- C. Permanent sleeves are not required for holes formed by removable PE sleeves.
- D. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical and electrical equipment areas or other wet areas 2 inches above finished floor level. Extended cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Install sleeves that are large enough to provide ¼ inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - 4. Steel Pipe Sleeves: For pipes smaller than 6 inches.
 - a. Steel Pipe Sleeves: For pipes 6 inches and larger, penetrating gypsum-board partitions.
 - b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast iron soil pipe to extend sleeve to 2 inches below finished floor level. Refer to Section 076200 – Sheet Metal Flashing and Trim for flashing.
 - 5. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Joint Seals for materials and installation.

- E. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeves size to allow for 1 inch annular clear space between pipe and sleeves for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast iron “wall pipes” for sleeves 6 inches and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- F. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Section 078400 – Firestopping Systems for materials.
- G. Verify final equipment locations for roughing-in.
- H. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

END OF SECTION

SECTION 23 0513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General construction and requirements.
- B. Applications.
- C. Single phase electric motors.
- D. Three phase electric motors.

1.02 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.
- 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.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Operation Data: Include instructions for safe operating procedures.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Baldor Electric Company/ABB Group: www.baldor.com.
- B. Leeson Electric Corporation: www.leeson.com.
- C. Regal-Beloit Corporation (Century): www.centuryelectricmotor.com.
- D. or approved equal.

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Construction:
 - 1. Open drip-proof type except where specifically noted otherwise.
 - 2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
 - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- C. Wiring Terminations:
 - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.03 APPLICATIONS

- A. Single phase motors for pumps: Capacitor start, capacitor run type.

2.04 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.

- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.05 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- B. Design, Construction, Testing, and Performance: Comply with NEMA MG 1 for Design B motors.
- C. Insulation System: NEMA Class B or better.
- D. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

2.06 ELECTRONICALLY COMMUTATED MOTORS (ECM)

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 23 0516

EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.

1.02 REFERENCE STANDARDS

- A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.
- B. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2013.
- C. ASME B16.11 - Forged Fittings, Socket-welding and Threaded; 2016 (Errata 2017).

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
 - 2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

- A. Manufacturers:
 - 1. Mercer Rubber Company: www.mercer-rubber.com.
 - 2. The Metraflex Company: www.metraflex.com/#sle.
 - 3. or approved equal.
- B. Inner Hose: Bronze.
- C. Exterior Sleeve: Single braided, stainless steel.
- D. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).
- E. Joint: Flanged.
- F. Size: Use pipe sized units.

2.02 EXPANSION JOINTS - STAINLESS STEEL BELLOWS TYPE

- A. Manufacturers:
 - 1. Mercer Rubber Company: www.mercer-rubber.com.
 - 2. The Metraflex Company: www.metraflex.com/#sle.
 - 3. or approved equal.
- B. Pressure Rating: 125 psi and 400 degrees F (862 kPa and 204 degrees C).
- C. Maximum Compression: 1-3/4 inches (45 mm).
- D. Maximum Extension: 1/4 inch (6 mm).
- E. Joint: As specified for pipe joints.
- F. Size: Use pipe sized units.

2.03 EXPANSION JOINTS - EXTERNAL RING CONTROLLED STAINLESS STEEL BELLOWS TYPE

- A. Manufacturers:
 - 1. Mercer Rubber Company: www.mercer-rubber.com.
 - 2. The Metraflex Company: www.metraflex.com/#sle.
 - 3. or approved equal.
- B. Pressure Rating: 125 psi and 400 degrees F (862 kPa and 204 degrees C).
- C. Maximum Compression: 15/16 inch (24 mm).

- D. Maximum Extension: 5/16 inch (8 mm).
- E. Maximum Offset: 1/8 inch (3 mm).
- F. Joint: Flanged.
- G. Size: Use pipe sized units.
- H. Accessories: Internal flow liner and external shroud.
- I. Application: Steel piping over 2 inches (50 mm).

2.04 EXPANSION JOINTS - HOSE AND BRAID

- A. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support bracket and air release or drain plug.
- B. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.
- C. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
 - 1. Maximum Allowable Working Pressure: 150 psig (1030 kPa) at 120 degrees F (49 degrees C).
 - 2. Accommodate the Following:
 - a. Axial Deflection in Compression and Expansion: .5 inch
 - b. Lateral Movement: .5 inch
 - c. Angular Rotation: 15 degrees.
 - d. Force developed by 1.5 times specified maximum allowable operating pressure.
 - 3. End Connections: Same as specified for pipe jointing.
 - 4. End Connections: Threaded; complying with ASME B16.11.
 - 5. Provide necessary accessories including, but not limited to, swivel joints.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- C. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

END OF SECTION

SECTION 23 0517

SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe sleeves.

1.02 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.04 DELIVERY, STORAGE, AND HANDLING

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

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
 - 1. Zinc coated or cast iron pipe.
 - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
 - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
 - 2. Connect sleeve with floor plate except in mechanical rooms.
- E. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
 - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
 - 2. Connect sleeve with floor plate except in mechanical rooms.
- F. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect.
- G. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.
 - 3. All Rated Openings: Caulked tight with fire stopping material conforming to ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

PART 3 EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

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

END OF SECTION

SECTION 23 0519
METERS AND GAGES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Positive displacement meters.
- B. Flow meters.
- C. Pressure gauges and pressure gauge taps.
- D. Thermometers and thermometer wells.
- E. Static pressure gauges.

1.02 REFERENCE STANDARDS

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.
- B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi; 2007.
- C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.
- D. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance; 2012.
- E. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.04 FIELD CONDITIONS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 POSITIVE DISPLACEMENT METERS (LIQUID)

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. FMC Technologies: www.fmctechnologies.com.
 - 3. Venture Measurement, a Danaher Corporation Company: www.venturemeasurement.com.
 - 4. or approved equal.

2.02 LIQUID FLOW METERS

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. McCrometer: www.mccrometer.com.
 - 3. Venture Measurement, a Danaher Company: www.venturemeasurement.com.
 - 4. Veris Industries: www.veris.com.
 - 5. or approved equal.
- B. Calibrated ASME MFC-3M Venturi orifice plate and flanges with valved taps, chart for conversion of differential pressure readings to flow rate, with pressure gauge in case.

2.03 PRESSURE GAUGES

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. Moeller Instrument Company, Inc: www.moellerinstrument.com.
 - 3. Omega Engineering, Inc: www.omega.com.
 - 4. or approved equal.

- B. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
 - 1. Case: Steel with brass bourdon tube.
 - 2. Size: 4-1/2 inch (115 mm) diameter.
 - 3. Mid-Scale Accuracy: One percent.
 - 4. Scale: Psi.

2.04 PRESSURE GAUGE TAPPINGS

- A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi (1034 kPa).
- B. Needle Valve: Brass, 1/4 inch (6 mm) NPT for minimum 150 psi (1034 kPa).

2.05 DIAL THERMOMETERS

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. Omega Engineering, Inc: www.omega.com.
 - 3. Weksler Glass Thermometer Corp: www.wekslerglass.com.
 - 4. or approved equal.
- B. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
 - 1. Size: 5 inch (125 mm) diameter dial.
 - 2. Lens: Clear glass.
 - 3. Accuracy: 1 percent.
 - 4. Calibration: Degrees F.

2.06 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

2.07 STATIC PRESSURE GAUGES

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. Omega Engineering, Inc: www.omega.com.
 - 3. Veris Industries: www.veris.com.
 - 4. Weksler Glass Thermometer Corp: www.wekslerglass.com.
 - 5. or approved equal.
- B. 3-1/2 inch (90 mm) diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install positive displacement meters with isolating valves on inlet and outlet to AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.
- C. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- E. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- F. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.02 SCHEDULE

- A. Positive Displacement Meters, Location:
 - 1. Expansion tank make-up.
- B. Flow Meters, Location:
 - 1. Heating water system.
- C. Pressure Gauges, Location and Scale Range:
 - 1. Pumps, 0 to 100 psi
 - 2. Expansion tanks, 0 to 100 psi
 - 3. Pressure tanks, 0 to 100 psi
- D. Stem Type Thermometers, Location and Scale Range:
 - 1. Headers to central equipment, 0 to 300 degrees F
 - 2. Boilers - inlets and outlets, 0 to 300 degrees F
 - 3. Water zone supply and return, 0 to 300 degrees F
 - 4. After major coils, 0 to 300 degrees F
 - 5. Domestic hot water supply and recirculation, 0 to 300 degrees F
- E. Thermometer Sockets, Location:
 - 1. Control valves 1 inch (25 mm) & larger - inlets and outlets.
 - 2. Cabinet heaters - inlets and outlets.

END OF SECTION

SECTION 23 0523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Globe valves.
- D. Ball valves.
- E. Butterfly valves.
- F. Check valves.
- G. Gate valves.
- H. Plug valves.
- I. Chainwheels.

1.02 ABBREVIATIONS AND ACRONYMS

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

1.03 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- C. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- E. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2017.
- F. ASME B31.9 - Building Services Piping; 2014.
- G. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.
- H. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).
- I. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2014).
- J. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
- K. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- L. MSS SP-67 - Butterfly Valves; 2017.
- M. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2011, with Errata (2013).
- N. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.

- O. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- P. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.
- Q. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
 - 2. Protect valve parts exposed to piped medium against rust and corrosion.
 - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
 - 4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
 - 5. Secure check valves in either the closed position or open position.
 - 6. Adjust butterfly valves to closed or partially closed position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
 - 2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors in dry environment.
- C. Exercise the following precautions for handling:
 - 1. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:
 - 1. Throttling (Hydronic): Butterfly, Ball, and Globe.
 - 2. Isolation (Shutoff): Butterfly and Gate.
 - 3. Swing Check (Pump Outlet):
 - a. 2 NPS (50 DN) and Smaller: Bronze with bronze disc.
 - b. 2-1/2 NPS (65 DN) and Larger: Iron with lever and weight, lever and spring, or center-guided with resilient seat.
 - 4. Dead-End: Butterfly, single-flange (lug) type.
- B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.
- C. Heating Hot Water Valves:
 - 1. 2 NPS (50 DN) and Smaller, Brass and Bronze Valves:
 - a. Threaded ends.
 - b. Angle: Bronze disc, Class 125.
 - c. Ball: Full port, one piece, brass trim.
 - d. Swing Check: Bronze disc, Class 125.

- e. Gate: NRS, Class 125.
- f. Globe: Bronze disc, Class 125.
- 2. 2-1/2 NPS (65 DN) and Larger, Iron Valves:
 - a. 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Threaded ends.
 - b. Ball: 2-1/2 NPS (65 DN) to 10 NPS (250 DN), Class 150.
 - c. Single-Flange Butterfly: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), aluminum-bronze disc, EPDM seat, 200 CWP.
 - d. Grooved-End Butterfly: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), 175 CWP.
 - e. Swing Check: Metal seats, Class 125.
 - f. Swing Check: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), lever and spring closure control, Class 125.
 - g. Plate-Type Check: Single plate, metal seat, Class 125 .
 - h. Gate: NRS, Class 125.
 - i. Globe: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), Class 125.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
- D. Valves in Insulated Piping: Provide 2 NPS (50 DN) stem extensions and the following features:
 - 1. Gate Valves: Rising stem.
 - 2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: Extended neck.
 - 4. Memory Stops: Fully adjustable after insulation is installed.
- E. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 - 3. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
 - 1. Building Services Piping Valves: ASME B31.9.

2.03 BRONZE ANGLE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa).
 - 1. Comply with MSS SP-80, Type 1.
 - 2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
 - 3. Ends: Threaded.
 - 4. Stem: Bronze.
 - 5. Disc: Bronze, PTFE, or TFE.
 - 6. Packing: Asbestos free.
 - 7. Handwheel: Bronze or aluminum.

2.04 BRONZE GLOBE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa).
 - 1. Comply with MSS SP-80, Type 1.
 - 2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
 - 3. Ends: Threaded or solder joint.
 - 4. Stem and Disc: Bronze or PTFE.
 - 5. Packing: Asbestos free.
 - a. Handwheel: Malleable iron.

2.05 IRON GLOBE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa).
 - 1. Comply with MSS SP-85, Type I.
 - 2. Body: Gray iron; ASTM A126, with bolted bonnet.
 - 3. Ends: Flanged.
 - 4. Trim: Bronze.
 - 5. Packing and Gasket: Asbestos free.
 - 6. Operator: Handwheel or chainwheel.

2.06 BRASS BALL VALVES

- A. One Piece, Reduced Port with Brass Trim:
 - 1. Comply with MSS SP-110.
 - 2. CWP Rating: 400 psig (2760 kPa).
 - 3. Body: Forged brass.
 - 4. Ends: Threaded.
 - 5. Seats: PTFE or TFE.
 - 6. Stem: Brass.
 - 7. Ball: Chrome-plated brass.
- B. Two Piece, Full Port and Regular Port with Stainless Steel Trim:
 - 1. Comply with MSS SP-110.
 - 2. SWP Rating: 150 psig (1035 kPa).
 - 3. CWP Rating: 600 psig (4140 kPa).
 - 4. Body: Forged brass.
 - 5. Ends: Threaded.
 - 6. Seats: PTFE or TFE.
 - 7. Ball: Chrome-plated brass.

2.07 BRONZE BALL VALVES

- A. One Piece, Reduced Port with Bronze Trim:
 - 1. Comply with MSS SP-110.
 - 2. CWP Rating: 400 psig (2760 kPa).
 - 3. Body: Bronze.
 - 4. Ends: Threaded.
 - 5. Seats: PTFE.
- B. Two Piece, Regular Port and Full Port with Bronze or Brass Trim:
 - 1. Comply with MSS SP-110.
 - 2. SWP Rating: 150 psig (1035 kPa).
 - 3. CWP Rating: 600 psig (4140 kPa).
 - 4. Body: Bronze.
 - 5. Ends: Threaded.
 - 6. Seats: PTFE .
 - 7. Stem: Bronze or brass.

2.08 IRON BALL VALVES

- A. Split Body, Full Port:
 - 1. Comply with MSS SP-72.
 - 2. CWP Rating: 200 psig (1380 kPa).
 - 3. Body: ASTM A126, gray iron.
 - 4. Ends: Flanged.
 - 5. Seats: PTFE.
 - 6. Stem: Stainless steel.
 - 7. Ball: Stainless steel.

2.09 IRON, SINGLE FLANGE BUTTERFLY VALVES

- A. Lug type: Bi-directional dead end service without downstream flange.
 - 1. Comply with MSS SP-67, Type I.
 - 2. CWP Rating: 150 psig (1035 kPa).
 - 3. Body Material: ASTM A126 cast iron.
 - 4. Stem: One or two-piece stainless steel.
 - 5. Seat: NBR.
 - 6. Disc: Coated ductile iron.

2.10 IRON, GROOVED-END BUTTERFLY VALVES

- A. CWP Rating: 175 psig (1200 kPa).
 - 1. Comply with MSS SP-67, Type I.
 - 2. Body: Coated ductile iron.
 - 3. Stem: Stainless steel.
 - 4. Disc: Coated ductile iron.
 - 5. Disc Seal: EPDM.

2.11 BRONZE SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa).
 - 1. Comply with MSS SP-80, Type 3.
 - 2. Body Design: Horizontal flow.
 - 3. Body Material: Bronze, ASTM B62.
 - 4. Ends: Threaded.
 - 5. Disc: Bronze.

2.12 IRON, FLANGED END SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa) with Metal Seats.
 - 1. Comply with MSS SP-71, Type I.
 - 2. Design: Clear or full waterway with flanged ends.
 - 3. Body: Gray iron with bolted bonnet in accordance with ASTM A126.
 - 4. Trim: Bronze.
 - 5. Disc Holder: Bronze.
 - 6. Gasket: Asbestos free.

2.13 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

2.14 IRON, CENTER-GUIDED CHECK VALVES

2.15 IRON, PLATE-TYPE CHECK VALVES

2.16 BRONZE GATE VALVES

- A. Non-Rising Stem (NRS), Rising Stem (RS):
 - 1. Comply with MSS SP-80, Type I.
 - 2. Body Material: Bronze with integral seat and union-ring bonnet.
 - 3. Ends: Threaded or solder joint.
 - 4. Stem: Bronze.
 - 5. Disc: Solid wedge; bronze.
 - 6. Packing: Asbestos free.
 - 7. Handwheel: Malleable iron, bronze, or aluminum.

2.17 IRON GATE VALVES

- A. NRS or OS & Y:
 - 1. Comply with MSS SP-70, Type I.
 - 2. Class 125: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), CWP Rating: 200 psig (1380 kPa).
 - 3. Body Material: Gray iron with bolted bonnet.

4. Ends: Flanged.
5. Trim: Bronze.
6. Disc: Solid wedge.
7. Packing and Gasket: Asbestos free.

2.18 CHAINWHEELS

- A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.
 1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
 2. Attachment: For connection to ball and butterfly valve stems.
 3. Sprocket Rim with Chain Guides: Ductile iron include zinc coating.
 4. Chain: Hot-dip galvanized steel. Sized to fit sprocket rim.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1.06 QUALITY ASSURANCE

- A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 1. Comply with MFMA-4.
 2. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
 - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.
- D. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use expansion anchors or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 4. Hollow Masonry: Use toggle bolts.
 5. Hollow Stud Walls: Use toggle bolts.
 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 7. Sheet Metal: Use sheet metal screws.
 8. Wood: Use wood screws.
 9. Plastic and lead anchors are not permitted.
 10. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 INSTALLATION

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

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

3.02 FIELD QUALITY CONTROL

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

END OF SECTION

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vibration-isolated equipment support bases.
- B. Vibration isolators.
- C. External seismic snubber assemblies.
- D. Seismic restraint systems.

1.02 REFERENCE STANDARDS

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; 2015.
- B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.
 - 2. Include seismic rating documentation for each isolator and restraint component accounting for horizontal, vertical, and combined loads.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General:
 - 1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
 - 2. Steel springs to function without undue stress or overloading.

2.02 VIBRATION ISOLATORS

- A. General Requirements:
 - 1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
- B. Seismic Type:
 - 1. Coil Springs Consisting of Single Elements:
 - a. Housing: Manufactured from cast iron material.
 - b. Ductile Material: Designed and rated for seismic applications.
 - c. Spring: Restrained by housing without significant degradation of vibration isolation capabilities during normal equipment operating conditions.
 - d. Resilient Snubbing Grommet System: Incorporated and designed with clearances of no more than 0.25 inch (6 mm) in any direction preventing direct metal-to-metal contact between supported member and fixed restraint housing.
 - e. Resilient Pad: Located in series with spring.
 - f. Coil Springs: Color coded elements to have a lateral stiffness greater than 0.8 times the rated vertical stiffness with 50 percent overload capacity.
 - g. Finish: Suitable for the application.

2.03 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

- A. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.
- B. Seismic Snubbing Elements:
 - 1. Air Gap: Between 0.125 inches (3 mm) and 0.25 inches (6 mm) unless otherwise indicated.

2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch (6 mm) thick; capable of being visually inspected for damage and replaced.
- C. Comply with:
 1. ASHRAE (HVACA) Handbook - HVAC Applications.
 2. FEMA 412.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

3.02 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- C. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

END OF SECTION

SECTION 23 0566

ANTI-MICROBIAL ULTRAVIOLET EMITTERS FOR HVAC DUCTS AND EQUIPMENT

PART 1 - GENERAL

1.01 ANTI-MICROBIAL ULTRAVIOLET EMITTERS DESCRIPTION

- A. The series UV-DUCT-FL includes modules for disinfecting air in air conditioning systems (HVAC) with a reduction of microbial load of 99.9%.
- B. These modules consist of a box structure (flange) from which two UV lamps emerge, in the form of "U", protected by a stainless-steel grid. They are generally applied along the ducts of air conditioning (pic. n.2).
- C. The modularity of this device allows a straightforward application in all types of conduct, also in the final sectors of the UTA (Air Handling Unit), with the ability to adapt to different needs and different sizes of ducts.
- D. The main characteristics of UV-DUCT-FL, as the compact dimensions and device controls, allow a quick and easy installation, directly inside the air conditioning ducts.
- E. **DEVICE REQUIREMENTS**
 - 1. UV-C device must consist of a box structure in stainless Steel (flange) from which two UV lamps emerge, in the form of "U", protected by a stainless-steel grid/cage. The air flow must pass entirely parallel or perpendicular to this "grid" of UV-C lamps.
- F. **QUALITY ASSURANCE**
 - 1. Manufacturer must be ISO 9001:2015 and 13485 certified (at least).
 - 2. The manufacturer for the above mentioned shall have at least 5 years of experience in the manufacturing and installation of such UV-C.
 - 3. Manufacturer must be a IUVA (International UltraViolet Association) member at least for 3 years.
 - 4. Manufacturer must be a registered EPA producer.
- G. **DEVICE PERFORMANCE**
 - 1. Device must be rated IP 20 or higher.
 - 2. UV-C bulbs shall be Selective UV-C lamp (emission peak at 253.7 nm) high output and high efficiency, pure quartz, PLL one end, ozone free; lamp's life should be at least 18,000 hours.
 - 3. Available lamp power must be 35W, 60W, or 95W.
 - 4. System should be powered by electronic ballasts specific for UV-C rays lamps.
 - 5. UV-C device must consist of a box structure in stainless Steel (flange) from which two UV lamps emerge, in the form of "U", protected by a stainless-steel grid/cage. The air flow must pass entirely parallel or perpendicular to this "grid" of UV-C lamps.
 - 6. The Stainless-steel supply box should contain lamps' LED Synoptic view showing each and single lamp operating and alarms.
 - 7. Device must be labeled to indicate: Power V, Hz, A, IP protection grade, - CEE 73/23 - 89/336 - 2002/95, year of production, item number.
- H. **SUBMITTALS**
 - 1. Manufacturer's data sheets on each product to be used, including:
 - a. Preparation instructions and recommendations
 - b. Installation methods
 - 2. Device drawings including components, overall dimensions and required clearances.
- I. **DELIVERY, STORAGE, AND HANDLING**
 - 1. Store products in manufacturer's packaging until ready for installation.
 - 2. Store products in-doors to protect from weather and excessive moisture.
- J. **WARRANTY**
 - 1. Manufacturer's standard limited warranty with the following warranty periods:
 - a. 2-year lamp warranty

- b. 5-year limited device warranty

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Manufacturer Information: Light Progress S.r.l., which is located at: Loc. San Lorenzo, 40 – 52031 – ANGIARI (AR), Italy; Tel: 888-580-8738; Email: team@lightprogress.com); Web: <http://www.lightprogress.com>
- B. ULTRAVIOLET GERMICIDAL IRRADIATION DEVICES FOR HVAC
 - 1. UV-DUCT-FL:
 - a. Compact duct or plenum mounted UVGI device for air disinfection.
 - b. Product: UV-DUCT-FL as manufactured by Light Progress S.r.l.
 - c. Model: UV-DUCT-FL 2/35HP-NX, 110-277 V, 2,35 W, 254nm, high output, low pressure mercury vapor, U-lamp.
 - d. Model: UV-DUCT-FL 2/60HP-NX, 110-277 V, 2,60 W, 254nm, high output, low pressure mercury vapor, U-lamp.
 - e. Model: UV-DUCT-FL 2/95HP-NX, 110-277 V, 2,95 W, 254nm, high output, low pressure mercury vapor, U-lamp.
 - f. Dimensions:
 - 1) Stainless Steel box structure (LxWxH) of 16.14 inches x 5.12 inches x 2.76 inches
 - 2) Lamp length:
 - (a) UV-DUCT-FL 2/35/HP-NX = 7.2 inches
 - (b) UV-DUCT-FL 2/60/HP-NX = 15 inches
 - (c) UV-DUCT-FL 2/95/HP-NX = 20 inches

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until the air handling unit, plenum and main duct have been completely installed.
- B. If installation is the responsibility of another installer, notify project manager of unsatisfactory preparation before proceeding.
- C. PREPARATION
 - 1. Clean surface thoroughly prior to installation.
 - 2. Prepare surface using the methods recommended by the manufacturer for achieving the best result for installation.
 - 3. Ensure power supplied to the installation site is 110-277V, 50/60Hz.
- D. INSTALLATION
 - 1. Install in accordance with manufacturer's instructions.
 - 2. The contractor must verify placement of the device(s) according to existing conditions. The device must be relocated if conditions of installation do not reflect drawings/ specification. Placement of the device(s) must:
 - a. Yield desired light coverage inside the ductwork/ equipment.
 - b. Be positioned before the first takeoff from main ductwork trunks, where applicable, so all zones effected by the equipment receive treated air.
 - c. Maintain reasonable accessibility and clearances used for maintenance, cleaning, and bulb replacement.
 - 3. Install by making two openings on the AHU/plenum/duct wall and inserting the module's lamps inside the AHU/plenum/duct according to provided installation template.
 - 4. To fasten the device, screw the SS body on the external wall of the channel, using supplied screws.
 - 5. Test for proper seal of the rubber gasket(s) while device is in operation. All penetrations shall be sealed and made air tight.

E. PROTECTION

1. Store device(s) and bulb(s) to protect against damage before installation. Protect installed device until completion of project.

END OF SECTION 23 0566

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.
- C. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, Eighth Edition.
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Include at least the following in the plan:
 - a. List of all air flow, water flow, system capacity and to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Final test report forms to be used.
 - d. Details of how TOTAL flow will be determined; for example:
 - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
 - 2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
 - e. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
 - f. Procedures for formal deficiency reports, including scope, frequency and distribution.
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in I-P (inch-pound) units only.
 - 6. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Engineer.
 - g. Project Contractor.
 - h. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 - 4. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of three years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Air coil fins are cleaned and combed.
 - 8. Access doors are closed and duct end caps are in place.
 - 9. Air outlets are installed and connected.
 - 10. Hydronic systems are flushed, filled, and vented.
 - 11. Pumps are rotating correctly.
 - 12. Proper strainer baskets are clean and in place.
 - 13. Service and balance valves are open.

3.03 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Measure air quantities at air inlets and outlets.
- C. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- D. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

3.06 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Effect system balance with automatic control valves fully open to heat transfer elements.
- D. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

3.07 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Boiler Feedwater Pumps.
 - 2. HVAC Pumps.
 - 3. Air Coils.
 - 4. Air Handling Units.
 - 5. Air Filters.
 - 6. Air Terminal Units.
 - 7. Air Inlets and Outlets.

3.08 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. RPM.
 - 4. Service factor.
 - 5. Starter size, rating, heater elements.
 - 6. Sheave Make/Size/Bore.
- B. V-Belt Drives:
 - 1. Identification/location.
 - 2. Required driven RPM.
 - 3. Driven sheave, diameter and RPM.
 - 4. Belt, size and quantity.
- C. Pumps:
 - 1. Identification/number.
 - 2. Manufacturer.
 - 3. Size/model.
 - 4. Impeller.
 - 5. Design flow rate, pressure drop, BHP.
 - 6. Actual flow rate, pressure drop, BHP.
 - 7. Discharge pressure.
 - 8. Suction pressure.
 - 9. Total operating head pressure.

D. Combustion Equipment:

1. Boiler manufacturer.
2. Model number.
3. Serial number.
4. Firing rate.
5. Overfire draft.
6. Gas meter timing dial size.
7. Gas meter time per revolution.
8. Gas pressure at meter outlet.
9. Gas flow rate.
10. Percent carbon monoxide (CO).
11. Percent carbon dioxide (CO₂).
12. Percent oxygen (O₂).
13. Flue gas temperature at outlet.
14. Ambient temperature.
15. Percent combustion efficiency.

E. Heating Coils:

1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressures drop, design and actual.
8. Entering water temperature, design and actual.
9. Leaving water temperature, design and actual.
10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

F. Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow specified and actual.
6. Total static pressure (total external), specified and actual.
7. Discharge pressure.
8. Fan RPM.

G. Terminal Unit Data:

1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
6. Size.
7. Maximum design air flow.
8. Maximum actual air flow.

END OF SECTION

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Insulation jackets.

1.02 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- B. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated Ducts Conveying Air Above Ambient Temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

END OF SECTION

SECTION 23 0719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.
- B. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).
- C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.
- D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2017.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville Corporation: www.jm.com.
 - 3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
 - 5. Owens Corning Corporation; VaporWick Pipe Insulation: www.ocbuildingspec.com/#sle.
 - 6. or approved equal.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.

- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- E. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
 - 1. Aeroflex USA, Inc: www.aeroflexusa.com.
 - 2. Armacell LLC; AP Armaflex: www.armacell.us/#sle.
 - 3. K-Flex USA LLC; K-Flex Titan: www.kflexusa.com/#sle.
 - 4. or approved equal.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - 2. Maximum Service Temperature: 180 degrees F (82 degrees C).
 - 3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETS

- A. PVC Plastic.
 - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil (0.25 mm).
 - e. Connections: Brush on welding adhesive.
- B. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- E. Inserts and Shields:
 - 1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
- F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.
- G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.

3.03 SCHEDULE

- A. Heating Systems:
 - 1. Heating Water Supply and Return:
 - 2. Boiler Feed Water:

END OF SECTION

SECTION 23 0800
COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. See Section 01 9113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 01 9113.
- B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.
- D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
 - 1. Control system.
 - 2. Major and minor equipment items.
 - 3. Piping systems and equipment.
 - 4. Variable frequency drives.
 - 5. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
- E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 7800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.
- B. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

1.03 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1 - The HVAC&R Technical Requirements for the Commissioning Process; 2007, with Errata (2012).

1.04 SUBMITTALS

- A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
- B. Draft Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:
 - 1. System name.
 - 2. List of devices.
 - 3. Step-by-step procedures for testing each controller after installation, including:
 - a. Process of verifying proper hardware and wiring installation.
 - b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
 - c. Process of performing operational checks of each controlled component.
 - d. Plan and process for calibrating valve and damper actuators and all sensors.
 - e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
 - 4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has "passed" and is operating within the contract parameters.
 - 5. Description of the instrumentation required for testing.

6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.
- C. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.
- D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
 1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
 2. Full as-built set of control drawings.
 3. Full as-built sequence of operations for each piece of equipment.
 4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
 - a. Floor.
 - b. Room number.
 - c. Room name.
 - d. Reference drawing number.
 - e. Heating and/or cooling valve tag ID.
 5. Full print out of all schedules and set points after testing and acceptance of the system.
 6. Full as-built print out of software program.
 7. Electronic copy on disk of the entire program for this facility.
 8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
 9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
 10. Control equipment component submittals, parts lists, etc.
 11. Warranty requirements.
 12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
 13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
 - a. Sequences of operation.
 - b. Control drawings.
 - c. Points lists.
 - d. Controller and/or module data.
 - e. Thermostats and timers.
 - f. Sensors and DP switches.
 - g. Valves and valve actuators.
 - h. Dampers and damper actuators.
 - i. Program setups (software program printouts).
- E. Project Record Documents: See Section 01 7800 for additional requirements.
 1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
 2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.
- F. Draft Training Plan: In addition to requirements specified in Section 01 7900, include:
 1. Follow the recommendations of ASHRAE Guideline 1.1.
 2. Control system manufacturer's recommended training.
 3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.
- G. Training Manuals: See Section 01 7900 for additional requirements.

1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.01 PREPARATION

- A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.
- B. Furnish additional information requested by the Commissioning Authority.
- C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.
- D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.
- E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
- F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.
- G. Provide temperature and pressure taps in accordance with Contract Documents.

3.02 INSPECTING AND TESTING - GENERAL

- A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.
- B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.
- C. Provide two-way radios for use during the testing.
- D. Valve/Damper Stroke Setup and Check:
 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 2. Set pump/fan to normal operating mode.
 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 4. Command valve/damper open; verify position is full open and adjust output signal as required.
 5. Command valve/damper to a few intermediate positions.
 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- E. Isolation Valve or System Valve Leak Check: For valves not by coils.
 1. With full pressure in the system, command valve closed.
 2. Use an ultra-sonic flow meter to detect flow or leakage.
- F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.03 TAB COORDINATION

- A. TAB: Testing, adjusting, and balancing of HVAC.
- B. Coordinate commissioning schedule with TAB schedule.
- C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.
- D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.
- E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.
- F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.04 CONTROL SYSTEM FUNCTIONAL TESTING

- A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.
- B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.
- C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.
- D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
 - 1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
 - 2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.
- E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.
- F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
 - 1. Setpoint changing features and functions.
 - 2. Sensor calibrations.
- G. Demonstrate to the Commissioning Authority:
 - 1. That all specified functions and features are set up, debugged and fully operable.
 - 2. That scheduling features are fully functional and setup, including holidays.
 - 3. That all graphic screens and value readouts are completed.
 - 4. Correct date and time setting in central computer.
 - 5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
 - 6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
 - 7. Power failure and battery backup and power-up restart functions.
 - 8. Global commands features.
 - 9. Security and access codes.
 - 10. Occupant over-rides (manual, telephone, key, keypad, etc.).
 - 11. O&M schedules and alarms.
 - 12. Occupancy sensors and controls.
 - 13. All control strategies and sequences not tested during controlled equipment testing.
- H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating

practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.05 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01 7800 for additional requirements.
- B. Add design intent documentation furnished by Engineer to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.06 DEMONSTRATION AND TRAINING

- A. See Section 01 7900 for additional requirements.
- B. Demonstrate operation and maintenance of HVAC system to Owner's personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.
- C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.
- D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:
 - 1. HVAC Control System: 4 hours.
 - 2. Boilers and System: 4 hours.
 - 3. Chemical Treatment: 4 hours.
 - 4. Variable Speed Drives: 4 hours.
- E. TAB Review: Instruct Owner's personnel for minimum 8 hours, after completion of TAB, on the following:
 - 1. Review final TAB report, explaining the layout and meanings of each data type.
 - 2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
 - 3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
 - 4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
 - 5. Other salient information that may be useful for facility operations, relative to TAB.
- F. HVAC Control System Training: Perform training in at least three phases:
 - 1. Phase 1 - Basic Control System: Provide minimum of 8 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
 - a. This training may be held on-site or at the manufacturer's facility.
 - b. If held off-site, the training may occur prior to final completion of the system installation.
 - c. For off-site training, Contractor shall pay expenses of up to two attendees.
 - 2. Phase 2 - Integrating with HVAC Systems: Provide minimum of 8 hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
 - a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
 - b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.

- c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
 - d. Every display screen, allowing time for questions.
 - e. Point database entry and modifications.
- 3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of 8 hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.
- G. Provide the services of manufacturer representatives to assist instructors where necessary.
- H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 23 0913

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air Supply System:
 - 1. Particle filters.
 - 2. Airborne oil filters.
- B. Control panels.
- C. Control Valves:
 - 1. Ball valves and actuators.
 - 2. Electronic operators.
- D. Dampers.
- E. Damper Operators:
 - 1. Electric operators.
- F. Input/Output Sensors:
 - 1. Temperature sensors.
 - 2. Damper position indicators.
 - 3. Carbon monoxide sensors.
 - 4. Carbon dioxide sensors.
- G. Thermostats:
 - 1. Electric room thermostats.
 - 2. Room thermostat accessories.
 - 3. Outdoor reset thermostats.
- H. Flow Sensors:
 - 1. Insertion turbine meters.
 - 2. Positive displacement flow meters.

1.02 RELATED REQUIREMENTS

- A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.
- B. Section 26 2726 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2012.
- B. ANSI C12.1 - Electric Meters - Code for Electricity Metering; 2016.
- C. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2013.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 AIR SUPPLY SYSTEM

- A. Particle Filters:
- B. Airborne Oil Filters:
 - 1. Rated for service with filtration efficiencies of 99.9 percent for particles of 0.025 micron or larger particles of airborne lubricating oil.

2.03 CONTROL PANELS

- A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.
- B. NEMA 250, general purpose utility enclosures with enameled finished face panel.

2.04 CONTROL VALVES

- A. Ball Valves and Actuators:
 - 1. Service: Use for brine (30 percent glycol), chilled water, hot water, or steam at 15 to 25 psig (104.4 to 172.4).
 - 2. Flow Characteristic: Include 2-way and 3-way diverting operation configured to fail normally closed (NC).
 - 3. Replacements in Kind: Provide pressure-independent type.
 - 4. Rangeability: 500 to 1.
 - 5. ANSI Rating: Class 150.
 - 6. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
 - 7. Body Size:
 - a. Service Temperature:
 - 1) Fluid Side: 0 to 284 degrees F (0 to 140 degrees C) liquid or 25 psig (172.4 kPa) steam.
 - 2) Ambient Side: From minus 4 to 122 degrees F (minus 20 to 50 degrees C).
 - 8. Actuator Requirements:
 - a. Assembly: Factory-mounted.
 - b. Input: 0 to 5 VDC configured for proportional control.
 - c. Accessories: Provide with valve position indicator and manual override.

2.05 DAMPERS

- A. Performance: Test in accordance with AMCA 500-D.
- B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gauge, 0.1046 inch (2.66 mm).
- C. Blades: Galvanized steel, maximum blade size 8 inches (200 mm) wide, 48 inches (1200 mm) long, minimum 22 gauge, 0.0299 inch (0.76 mm), attached to minimum 1/2 inch (13 mm) shafts with set screws.

2.06 DAMPER OPERATORS

- A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.

2.07 INPUT/OUTPUT SENSORS

- A. Temperature Sensors:
 - 1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
- B. Carbon Dioxide Sensors, Duct and Wall:
 - 1. General: Provide non-dispersive infrared (NDIR), diffusion sampling CO2 sensors with integral transducers and linear output.

2.08 THERMOSTATS

- A. Outdoor Reset Thermostats:
 - 1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
 - 2. Scale range: Minus 10 to 70 degrees F (2 to 35 degrees C).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches (1500 mm) above floor. Align with lighting switches and humidistats. Refer to Section 26 2726.
- C. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements.

END OF SECTION

SECTION 23 0993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
 - 1. Heating coils.
 - 2. Heating water zone control.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
 - 1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
 - 2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in Contract Documents.
 - 3. Include at least the following sequences:
 - a. Start-up.
 - b. Warm-up mode.
 - c. Normal operating mode.
 - d. Unoccupied mode.
 - e. Shutdown.
 - f. Capacity control sequences and equipment staging.
 - g. Temperature and pressure control, such as setbacks, setups, resets, etc.
- C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
 - 1. Label with settings, adjustable range of control and limits.
- D. Points List: Submit list of all control points indicating at least the following for each point.
 - 1. Name of controlled system.
 - 2. Point abbreviation.
 - 3. Point description; such as dry bulb temperature, airflow, etc.
 - 4. Display unit.
 - 5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
 - 6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
- E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 HEATING COILS

- A. Single temperature thermostat set at 75 degrees F (24 degrees C) maintains constant space temperature during the day and 15 degrees F cooler at night (during the day and 8 degrees C cooler at night) by modulating two-way control heating valve with spring range of 3 to 7 psig (with spring range of 20 to 48 kPa).

3.02 HEATING WATER ZONE CONTROL

- A. Control heating water supply temperature set at 180 degrees F (82 degrees C) in accordance with outdoor reset schedule by modulating heating water control valve.

END OF SECTION

SECTION 23 0995
BACNET BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General, Supplementary, and Special Conditions, and Division 1 - General Requirements, apply to work specified in this section. Subcontractor must familiarize himself with the terms of the above documents.

1.02 QUALIFICATIONS OF BIDDER

- A. All bidders must be building automation contractors in the business of installing direct digital control building automation systems for a minimum of 3 years.
- B. All bidders must have a service and installation office in the (city name) area.
- C. All bidders must be authorized distributors or branch offices of the manufacturers specified.
- D. All bidders must have a trained staff of application engineers, who have been certified by the manufacturer in the configuration, programming and service of the automation system.
- E. The following bidders have been pre-qualified:
- F. Andover Controls Corporation
- G. Or as approved by Owners.

1.03 SCOPE OF WORK

- A. The Contractor shall furnish and install a complete building automation system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. All components of the system - workstations, application controllers, unitary controllers, etc. shall communicate using the BACnet protocol, as defined by ASHRAE Standard 135-2012. No gateways shall be used for communication to controllers furnished under this section. At a minimum, provide controls for the following:
 - 1. Air handling units
 - 2. Return air fans
 - 3. Exhaust and supply fans
 - 4. Boilers including hot water pumps
 - 5. Refrigerant leak detection system
 - 6. Smoke evacuation sequence of AHUs and return fans including smoke control dampers and fire command override panel.
 - 7. Finned tube radiation control
 - 8. Cabinet unit heater controls
 - 9. Power wiring to DDC devices, smoke control dampers and BAS panels.
- B. Except as otherwise noted, the control system shall consist of all Ethernet Network Controllers, Standalone Digital Control Units, workstations, software, sensors, transducers, relays, valves, dampers, damper operators, control panels, and other accessory equipment, along with a complete system of electrical interlocking wiring to fill the intent of the specification and provide for a complete and operable system. Except as otherwise specified, provide operators for equipment such as dampers if the equipment manufacturer does not provide these. Coordinate requirements with the various Contractors.
- C. The BAS contractor shall review and study all HVAC drawings and the entire specification to familiarize himself with the equipment and system operation and to verify the quantities and types of dampers, operators, alarms, etc. to be provided.
- D. All interlocking, wiring and installation of control devices associated with the equipment listed below shall be provided under this Contract. When the BAS system is fully installed and operational, the BAS Contractor and representatives of the Owner will review and check out the system. At that time, the BAS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.

- E. Provide services and manpower necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and Owner's representative.
- F. All work performed under this section of the specifications will comply with all codes, laws and governing bodies. If the drawings and/or specifications are in conflict with governing codes, the Contractor shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this specification and associated drawings exceed governing code requirements, the specification will govern. The Contractor shall obtain and pay for all necessary construction permits and licenses.

1.04 TRAINING

- A. Provide a minimum of (40) hours of on-site training for (3) system operators. The training will be hands-on type at the owner's office. The training class will use the actual Operator's Manual that will be submitted for this project. In addition provide (2) weeks of classroom training for one individual at the Manufacturer's sponsored training courses.
- B. System Description
 - 1. The Building Automation System (BAS) shall be designed in strict accordance with ASHRAE's BACnet standard, 135-2012, to provide interoperability between different building subsystems. The system shall also provide a graphical, web-based operator interface that allows for instant access to any system through a standard browser.
 - 2. The system shall use BACnet network types and protocols exclusively. Non-BACnet-based systems are not acceptable. The contractor must provide PC-based programming workstations, operator workstations and microcomputer controllers of modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions. Contractor must provide manufacturer's Protocol Implementation Conformance Statement (PICS) for workstation software and every controller model that are installed.

1.05 FOR THIS PROJECT THE SYSTEM SHALL CONSIST OF THE FOLLOWING COMPONENTS:

- A. Administration and Programming Workstation(s).
 - 1. The BAS Contractor shall furnish (qty) Administration and Programming Workstation Computers and (qty) printer(s) as described in Part 2 of the specification. These workstations must be running the standard workstation software developed and tested by the manufacturer of the network controllers and the standalone controllers. No third party front-end workstation software will be acceptable. Workstations must conform to the B-OWS BACnet device profile.
- B. Web-Based Operator Workstations
 - 1. The BAS Contractor shall furnish licenses for (qty) concurrent users to the BAS system. Web-based users shall have access to all system points and graphics, shall be able to receive and acknowledge alarms, and shall be able to control setpoints and other parameters. A central web server shall be provided to manage the web-based users. The web-based interface must conform to the B-OWS BACnet device profile.
- C. Ethernet-based Network Router and/or Controller(s).
 - 1. The BAS Contractor shall furnish (qty) Ethernet-based network controllers as described in Part 2 of the specification. These controllers will connect directly to the Operator Workstation over Ethernet, using the BACnet/IP protocol at a minimum of 100mbps, and provide communication to the Standalone Digital Control Units and/or other Input/Output Modules. Network Controllers shall conform to BACnet device profile B-BC. Network controllers that utilize RS232 serial communications or ARCNET to communicate with the workstations will not be accepted.
 - 2. Network Controllers shall be tested and certified by the BACnet Testing Laboratory (BTL) as Building Controllers (B-BC).
- D. Standalone Digital Control Units (SDCUs).
 - 1. Provide the necessary quantity and types of SDCUs to meet the requirements of the project for mechanical equipment control including air handlers, central plant control, and terminal unit control. Each SDCU will operate completely standalone, containing all of the I/O and programs to control its associated equipment. Each SDCU shall conform to the BACnet device profile B-AAC.

2. SDCUs shall be tested and certified by the BACnet Testing Laboratory (BTL) as Advanced Application Controllers (B-AAC).

1.06 WORK BY OTHERS

- A. The BAS Contractor shall cooperate with other contractors performing work on this project necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work.
- B. The BAS Contractor shall furnish all control valves, sensor wells, flow meters and other similar equipment for installation by the Mechanical Contractor.
- C. The BAS Contractor shall provide field supervision to the designated contractor for the installation of the following:
 1. Automatic control dampers
- D. The Electrical Contractor shall provide:
 1. All power wiring to motors, heat trace, junction boxes for power to BAS panels.
 2. Furnish smoke detectors and wire to the building fire alarm system. HVAC Contractor to mount devices. BAS Contractor to hardwire to fan shut down.
 3. Auxiliary contact (pulse initiator) on the electric meter for central monitoring of kWH and KW. Electrical Contractor shall provide the pulse rate for remote readout to the BAS. BAS contractor to coordinate this with the electrical contractor.

1.07 CODE COMPLIANCE

- A. Provide BAS components and ancillary equipment, which are UL-916 listed and labeled.
- B. All equipment or piping used in conditioned air streams, spaces or return air plenums shall comply with NFPA 90A Flame/Smoke/Fuel contribution rating of 25/50/0 and all applicable building codes or requirements.
- C. All wiring shall conform to the National Electrical Code.
- D. All smoke dampers shall be rated in accordance with UL 555S.
- E. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.
- F. Comply with FCC, Part 68 rules for telephone modems and data sets.
- G. Submittals
 1. All shop drawings shall be prepared in Visio Professional or AutoCAD software. In addition to the drawings, the Contractor shall furnish a CD containing the identical information. Drawings shall be B size or larger.
 2. Shop drawings shall include a riser diagram depicting locations of all controllers and workstations, with associated network wiring. Also included shall be individual schematics of each mechanical system showing all connected points with reference to their associated controller. Typical will be allowed where appropriate.
 3. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification. Valve, damper and air flow station schedules shall indicate size, configuration, capacity and location of all equipment.
 4. Software submittals shall contain narrative descriptions of sequences of operation, program listings, point lists, and a complete description of the graphics, reports, alarms and configuration to be furnished with the workstation software. Information shall be bound or in a three ring binder with an index and tabs.
 5. Submit five (2) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.
 6. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

1.08 SYSTEM STARTUP & COMMISSIONING

- A. Each point in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.
- B. The BAS contractor shall commission and set in operating condition all major equipment and systems, such as the chilled water, hot water and all air handling systems, in the presence of the equipment manufacturer's representatives, as applicable, and the Owner and Architect's representatives.
- C. The BAS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor shall have a trained technician available on request during the balancing of the systems. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract.

1.09 TRAINING

- A. The BAS Contractor shall provide both on-site and classroom training to the Owner's representative and maintenance personnel per the following description:
- B. On-site training shall consist of a minimum of (40) hours of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include
 - 1. System Overview
 - 2. System Software and Operation
 - a. System access
 - b. Software features overview
 - c. Changing setpoints and other attributes
 - d. Scheduling
 - e. Editing programmed variables
 - f. Displaying color graphics
 - g. Running reports
 - h. Workstation maintenance
 - i. Application programming
 - j. Operational sequences including start-up, shutdown, adjusting and balancing.
 - k. Equipment maintenance.
- C. Classroom training will include a minimum of (1) training slot for two weeks of course material covering workstation operation and controller programming.

1.10 OPERATING AND MAINTENANCE MANUALS

- A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire BAS. This documentation shall include specific part numbers and software versions and dates. A complete list of recommended spare parts shall be included with the lead time and expected frequency of use of each part clearly identified.
- B. Following project completion and testing, the BAS contractor will submit as-built drawings reflecting the exact installation of the system. The as-built documentation shall also include a copy of all application software both in written form and on diskette.

1.11 WARRANTY

- A. The BAS contractor shall warrant the system for 12 months after system acceptance and beneficial use by the owner. During the warranty period, the BAS contractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification.
- B. Updates to the manufacturer's software shall be provided at no charge during the warranty period.

PART 2 - PRODUCTS

2.01 SYSTEM ARCHITECTURE

A. General

1. The Building Automation System (BAS) shall consist of Network Router/Controllers (NRCs), a family of Standalone Digital Control Units (SDCUs), Administration and Programming Workstations (APWs), Web-based Operator Workstations (WOWs), and one File Server to support system configurations where more than three operator workstations are required. The BAS shall provide control, alarm detection, scheduling, reporting and information management for the entire facility, and Wide Area Network (WAN) if applicable, from a single ODBC-compliant database.
2. The system shall be designed with a top-level 10/100bT Ethernet network, using the BACnet/IP protocol. A sub-network using the BACnet MS/TP protocol, with a minimum of 76.8kb speed, shall connect the local, stand-alone controllers with Ethernet-level controller/routers. The use of ARCNET, LON works, RS-232 serial communications, or BACnet Ethernet for these controllers is prohibited.
3. Level 1 Network Description
 - a. Level 1, the main backbone of the system, shall be an Ethernet 10/100bT LAN/WAN, using BACnet/IP as the communications protocol. Network Router/Controllers, Operator Workstations, and the Central File Server shall connect directly to this network without the need for Gateway devices.
4. Level 2 Network Description
 - a. Level 2 of the system shall consist of one or more BACnet MS/TP field buses managed by the Network Router/Controllers. Minimum speed shall be 76.8kbps. The Level 2 field bus consists of an RS485, token passing bus that supports up to 127 Standalone Digital Control Units (SDCUs) for operation of HVAC equipment and lighting

B. BAS LAN Segmentation

1. The BAS shall be capable of being segmented, through software, into multiple local area networks (LANs) distributed over a wide area network (WAN), sharing a single file server. This enables workstations to manage a single LAN (or building), and/or the entire system with all devices being assured of being updated by and sharing the most current database. In the case of a single workstation system, the workstation shall contain the entire database - with no need for a separate file server.

C. Standard Network Support

1. All NRCs, Workstation(s) and File Server shall be capable of residing directly on the owner's Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the NRC's, Workstation(s) and File Server shall be capable of using standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches and hubs. With this design the owner may utilize the investment of an existing or new enterprise network or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the owner's Information Systems Department as all devices utilize standard TCP/IP components.

D. System Expansion

1. The BAS system shall be scalable and expandable at all levels of the system using the same software interface, and the same Level 1 and Level 2 controllers. Systems that require replacement of either the workstation software or field controllers in order to expand the system shall not be acceptable.
2. The BAS shall be expandable to include Security and Access Control functions at any time in the future with no additional workstations, front-end software or Level 1 controllers required. Ethernet-based security/card access controllers shall be able to be added to the existing Level 1 network, to perform security and card access applications. In this way, an owner's existing investment in wiring infrastructure may be leveraged and the cost and inconvenience of adding new field bus wiring will be minimized.

3. Additionally, an integrated video badging option must be able to be included with no additional workstations required. This photo ID option must share the same database as the BAS in order to eliminate the need for updating multiple databases.
 4. Additional web-based operator licenses shall added in the field through an upgrade of the web server's security key, with no re-programming required.
 5. The system shall use the same application programming language for all levels: Operator Workstation, Network Router/Controller, and Standalone Digital Control Unit. Furthermore, this single programming language shall be used for all applications: environmental control, card access control, intrusion detection and security, lighting control, leak detection / underground storage tank monitoring, and digital data communication interfaces to third party microprocessor-based devices.
- E. Support For Open Systems Protocols
1. All hardware and software included under this section shall conform to BACnet standard 135-2001, to promote interoperability between building subsystems. Additionally, the BAS design must include solutions for the integration of the following "open systems" protocols: LonTalk®, Modbus, and digital data communication to third party microprocessors such as chiller controllers, fire panels and variable frequency drives (VFDs).
 2. The system shall also provide the ability to program custom ASCII communication drivers, that will reside in a BACnet Gateway, for communication to third party systems and devices. These drivers will provide real time monitoring and control of the third party systems. Once programmed, these data points shall be monitored and controlled in exactly the same manner as native BAS data points.

2.02 NETWORK ROUTER/CONTROLLERS (NRCS)

A. General

1. Network Router Controllers shall combine both network routing functions and control functions into a single unit. NRC's shall route communications between the BACnet/IP network and the BACnet MS/TP field network. They shall also be responsible for monitoring and controlling their own HVAC equipment such as an AHU or boiler. A sufficient number of NRCs shall be supplied to fully meet the requirements of this specification and the attached point list.
2. Each NRC shall be classified as a "native" BACnet device, supporting the BACnet Building Controller (B-BC) profile. Controllers that support a lesser profile such as B-SA are not acceptable. NRCs shall be tested and certified by the BACnet Testing Laboratory (BTL) as Advanced Application Controllers (B-BC).

B. Hardware Specifications

1. Memory:
 - a. Both the operating system of the controller, plus the application program for the controller, shall be stored in non-volatile, FLASH memory. Controllers shall contain enough memory for the current application, plus required history logging, plus a minimum of 20% additional free memory.
2. Communication Ports:
 - a. Each NRC shall provide communication to both the Workstation(s) and the field buses. An on-board 10/100bT Ethernet port shall be provided, as well as a RS-485 port for communications to a maximum of 127 MS/TP devices.
3. Modular Expandability:
 - a. The system shall employ a modular I/O design to allow easy expansion. Input and output capacity is to be provided through plug-in modules of various types. It shall be possible to combine I/O modules as desired to meet the I/O requirements for individual control applications.
4. Hardware Override Switches:
 - a. All digital outputs shall include three position manual override switches to allow selection of the ON, OFF, or AUTO output state. These switches shall be built into the unit and shall provide feedback to the controller so that the position of the override switch can be obtained through software. In addition each analog output shall be equipped with an override

potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.

5. Local Status Indicator Lamps:
 - a. Provide as a minimum LED indication of CPU status, Ethernet LAN status, and field bus status. For each output, provide LED indication of the value of the output (On/Off). For each output module provide an LED which gives a visual indication of whether any outputs on the module are manually overridden.
 6. Real Time Clock (RTC):
 - a. Each NRC shall include a battery-backed, real time clock, accurate to 10 seconds per day. The RTC shall provide the following: time of day, day, month, year, and day of week. The system shall automatically correct for daylight savings time and leap years and be Year 2000 compliant.
 7. Power Supply:
 - a. The power supply for the NRCs shall be auto sensing, 24Vac/10-40Vdc power, with a tolerance of +/- 20%. Line voltage below the operating range of the system shall be considered outages. The controller shall contain over voltage surge protection, and require no additional AC power signal conditioning.
 8. Automatic Restart After Power Failure:
 - a. Upon restoration of power after an outage, the NRC shall automatically and without human intervention: update all monitored functions; resume operation based on current, synchronized time and status, and implement special start-up strategies as required.
 9. Battery backup:
 - a. The NRC shall include an on-board battery to back up the controller's RAM memory. The battery shall provide accumulated backup of all RAM and clock functions for at least 30 days. In the case of a power failure, the NRC shall first try to restart from the RAM memory. If that memory is corrupted or unusable, then the NRC shall restart itself from its application program stored in its FLASH memory.
- C. Software Specifications
1. General:
 - a. The NRC shall contain FLASH memory to store both the resident operating system AND the application software. There will be no restrictions placed on the type of application programs in the system. Each NRC shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, printout of the program for storage, etc.
 2. User Programming Language:
 - a. The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints. The source program shall be English language-based and programmable by the user. The language shall be structured to allow for the easy configuration of control programs, schedules, alarms, reports, telecommunications, local displays, mathematical calculations, passwords, and histories. The language shall be self-documenting. Users shall be able to place comments anywhere in the body of a program. Program listings shall be configurable by the user in logical groupings.
 - b. Controllers that use a "canned" program method will not be accepted.
- D. Control Software:
1. The NRC shall have the ability to perform the following pre-tested control algorithms:
 2. Proportional, Integral plus Derivative Control (PID)
 3. Self-Tuning PID
 4. Two Position Control
 5. Digital Filter
 6. Ratio Calculator
 7. Equipment Cycling Protection

8. Mathematical Functions:
 - a. Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, Boolean logic statements, or combinations of both. The controllers shall be capable of performing complex logical statements including operators such as >, <, =, and, or, exclusive or, etc. These must be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.
9. Energy Management Applications:
 - a. NRCs shall have the ability to perform any or all of the following energy management routines:
 - b. Time of Day Scheduling
 - c. Calendar Based Scheduling
 - d. Holiday Scheduling
 - e. Temporary Schedule Overrides
 - f. Optimal Start
 - g. Optimal Stop
 - h. Night Setback Control
 - i. Enthalpy Switchover (Economizer)
 - j. Peak Demand Limiting
 - k. CFM Tracking
 - l. Heating/Cooling Interlock
 - m. Free Cooling
 - n. Hot Water Reset
10. History Logging:
 - a. Each controller shall be capable of LOCALLY logging any input, output, calculated value or other system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system can be logged in history. A minimum of 1000 values shall be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.
11. Alarm Management:
 - a. For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested each scan of the NRC and can result in the display of one or more alarm messages or reports.
 - b. Up to 8 alarms can be configured for each point in the controller.
 - c. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided.
 - d. If communication with the Operator Workstation is temporarily interrupted, the alarm will be time-stamped and buffered in the NRC. When communications return, the alarm will be transmitted to the Operator Workstation if the point is still in the alarm. condition.
 - e. Alarms must be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet/IP protocol.
12. Local Keypad/Display:
 - a. For each NRC, provide a local display of at least 4 lines, providing current display of all critical inputs and outputs that the NRC is controlling. Provide a keypad such that an operator can log on, scroll through point values, and change setpoints that are changeable. The keypad/display must be capable of being mounted either on the controller, or on a control panel door.
13. 2.4.6 Embedded Web Server
14. Each NRC must have the ability to serve out customized web pages containing any desired I/O values from the entire BAS.

2.03 STANDALONE DIGITAL CONTROL UNITS (SDCUS)

A. General:

1. Standalone Digital Control Units shall provide control of HVAC and lighting, including air handling units, rooftop units, variable air volume boxes, unit ventilators, and other mechanical equipment. Each controller shall be fully programmable, contain its own control programs and will continue to operate in the event of a failure or communication loss to its associated NRC. Each SDCU provided must be a “native” BACnet device, supporting the BACnet Advanced Application Controller (B-AAC) profile. Controllers that support a lesser profile such as B-SA are not acceptable. SDCUs shall be tested and certified by the BACnet Testing Laboratory (BTL) as Advanced Application Controllers (B-AAC).
- B. Memory:
 1. Both the operating system of the controller, plus the application program for the controller, shall be stored in non-volatile, FLASH memory. Controllers shall contain enough memory for the current application, plus required history logging, plus a minimum of 20% additional free memory.
- C. Communication Ports:
 1. SDCUs shall have a RS-485 communication port to the BACnet MS/TP field bus, operating at a speed of at least 76.8kbps.
- D. Input/Output:
 1. Each SDCU shall have enough inputs and outputs to meet the application’s required point count. Each SDCU shall support universal inputs, whereas any input may be software-defined as:
 2. Digital Inputs for status/alarm contacts
 3. Counter Inputs for summing pulses from meters.
 4. Thermistor Inputs for measuring temperatures in space, ducts and thermowells.
 5. Analog inputs for pressure, humidity, flow and position measurements.
 6. SDCU’s must support both digital and analog output types:
 7. Digital Outputs for on/off equipment control.
 8. Analog Outputs for valve and damper position control, and capacity control of primary equipment.
- E. Expandability:
 1. For larger controllers (16 base inputs and up), provide input and output expansion through the use of plug-in modules. At least two I/O modules must be capable of being added to the base SDCU.
- F. Hardware Override Switches:
 1. All digital outputs on air handling unit controllers shall include three position manual override switches to allow selection of the ON, OFF, or AUTO output state. These switches shall be built into the unit and shall provide feedback to the controller so that the position of the override switch can be obtained through software. In addition each analog output on air handling unit controllers shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.
- G. Room Sensor Support:
 1. The SDCU shall support a basic room thermistor in plain plastic cover; a room sensor with override and setpoint adjust slider; and, a sensor with a one-line display and 6-button keypad. The display sensor shall be able to display the current temperature, setpoint, outside air temperature, relative humidity and setpoint, occupancy mode, and CFM of the individual zone.
- H. Networking:
 1. Each SDCU will be able to exchange information on a peer to peer basis with other Standalone Digital Control Units, according to the BACnet MS/TP protocol. Each SDCU shall be capable of storing and referencing global variables (on the LAN) with or without any workstations online. Each SDCU shall be able to have its program viewed and/or enabled/disabled through a workstation connected to an NRC.
- I. Indicator Lamps:
 1. SDCUs will have as a minimum, LED indication of CPU status, and field bus status.
- J. Real Time Clock (RTC):
 1. All SDCUs shall have a real time clock in either hardware or software. The accuracy shall be within 10 seconds per day. The RTC shall provide the following information: time of day, day,

month, year, and day of week. Each SDCU shall receive a signal, every hour, over the network from the NRC, which synchronizes all SDCU real time clocks.

K. Automatic Restart After Power Failure:

1. Upon restoration of power, the SDCU shall automatically and without human intervention, update all monitored functions, resume operation based on current, synchronized time and status, and implement special start-up strategies as required.

L. Battery Back Up:

1. All SDCUs shall store all programming in non-volatile FLASH memory. All SDCUs except terminal controllers shall include an on-board lithium battery to back up the controller's RAM memory. The battery shall have a shelf life of over 10 years, and provide accumulated backup of all RAM and clock functions for at least 3 years. In the case of a power failure, the SDCU shall first try to restart from the RAM memory. If that memory is corrupted or unusable, then the SDCU shall restart itself from its application program stored in its FLASH memory.

M. Software - General.

1. The SDCU shall contain FLASH memory to store both the resident operating system AND the application software. There will be no restrictions placed on the type of application programs in the system. Each SDCU shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, printout of the program for storage, etc.

(n) User Programming Language:

- A. The application software shall be user programmable, using the same language as that defined for Network Router/Controllers. Controllers that use a "canned" program method will not be accepted.
- B. Control Software, Mathematical Functions, and Energy Management Applications must be identical to that which is provided with the Network Router/Controller.

2.03.15 HISTORY LOGGING:

- A. Each controller shall be capable of LOCALLY logging any input, output, calculated value or other system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system can be logged in history. A minimum of 1000 values shall be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.

2.04 ALARM MANAGEMENT:

- A. For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested each scan of the SDCU and can result in the display of one or more alarm messages or reports.
- B. Up to 8 alarms can be configured for each point in the controller.
- C. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided.
- D. If communication with the Operator Workstation is temporarily interrupted, the alarm will be time-stamped and buffered in the controller. When communications return, the alarm will be transmitted to the Operator Workstation if the point is still in the alarm condition.
- E. Alarms must be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet/IP protocol.

2.05 AIR HANDLER CONTROLLERS

- A. AHU Controllers shall conform to the BACnet Advanced Application Controller (B-AAC) device profile.
- B. AHU Controllers shall be capable of meeting the requirements of the sequence of operation found in the Execution portion of this specification and for future expansion.

- C. AHU Controllers shall support all the necessary point inputs and outputs as required by the sequence and operate in a standalone fashion.
- D. AHU Controllers shall be fully user programmable to allow for modification of the application software.
- E. A manual override switch shall be provided for all digital and analog outputs on the AHU Controller. The position of the switch shall be monitored in software and available for operator displays and alarm notification.
- F. Local Keypad/Display:
 - 1. For each air handler SDCU, provide a local display of at least 4 lines, providing current display of all critical inputs and outputs that the SDCU is controlling. Provide a keypad such that an operator can log on, scroll through point values, and change setpoints that are changeable. The keypad/display must be capable of being mounted either on the controller, or on a control panel door.

PART 3 - BACNET GATEWAY TO THIRD-PARTY DEVICES

3.01 GENERAL:

- A. Where required, provide a BACnet Gateway to interface to non-BACnet systems that use the Modbus protocol, LONworks protocol, or other proprietary protocol. The Gateway shall communicate directly over Ethernet TCP/IP, and shall use the BACnet/IP protocol to communicate with a BACnet Workstation (B-OWS).

3.02 COMMUNICATION PORTS:

- A. In addition to its on-board Ethernet port, the Gateway shall have at least two serial communications ports for interfaces to third-party systems.

3.03 MEMORY:

- A. The Gateway shall have enough RAM memory to store all point configuration data, plus required history logging and alarm buffering. Minimum RAM shall be 8MB. The operating system of the gateway must be stored in FLASH non-volatile memory.

3.04 USER PROGRAMMING LANGUAGE:

- A. The Gateway shall employ the same user programmable application software that NRCs and SDCUs use.
- B. Control Software, Mathematical Functions, and Energy Management Applications must be identical to that which is provided with the Network Router/Controller. Gateways that do not have an application programming language will not be accepted.

3.05 HISTORY LOGGING:

- A. Each Gateway shall be capable of LOCALLY logging any input, output, calculated value or other system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system can be logged in history. A minimum of 1000 values shall be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.

3.06 OPERATOR WORKSTATION REQUIREMENTS

- A. General.
 - 1. The operator workstation portion of the BAS shall consist of one or more full-powered configuration and programming workstations, and one or more web-based operator workstations. For this project provide (qty) programming workstations and (qty) web-based user licenses.
 - 2. The programming and configuration workstation software shall be configurable as either a single workstation system (with a local database) or multi-workstation system where the database is located on a central file server. The client software on multi-workstation system shall access the file server database program via an Ethernet TCP/IP network running at 100MBPS.
 - 3. The web-based user interface software must be capable of expansion up to 100 concurrent users.

4. All workstation software, both programming and software and web-based operator software, shall conform to the BACnet B-OWS device profile, using BACnet/IP to communicate to other BACnet devices.
 5. All configuration workstations shall be Pentium 4-based personal computers operating under the Microsoft Windows XP operating system. The application software shall be capable of communication to all Network Router/Controllers and Standalone Digital Control Units, feature high-resolution color graphics, alarming, reporting, and be user configurable for all data collection and data presentation functions.
 6. For multi-workstation systems, a minimum of 256 workstations shall be allowed on the Ethernet network along with the central file server. In this client/server configuration, any changes or additions made from one workstation will automatically appear on all other workstations without the requirement for manual copying of files. Multi-workstation systems with no central database will not be acceptable. Multi-workstation systems with distributed/tiered file servers and a central (master) database will be acceptable.
- B. Administration/Programming Workstation Requirements (Single workstation or multi-workstation configuration).
1. The workstation shall consist of the following:
 2. 3 GHz Pentium 4 processor with 4 GB of RAM
 3. Microsoft Windows 10 operating system
 4. Serial port, parallel port, USB port
 5. 10/100MBPS Ethernet NIC
 6. 500 GB hard disk
 7. CD-RW drive
 8. High resolution (minimum 1280 x 1024), 21" flat panel display
 9. Optical mouse and full function keyboard
 10. Audio sound card and speakers
 11. License agreement for all applicable software.
- C. File Server Hardware Requirements (if file server is shown on the drawings).
1. The file server computer shall contain of the following:
 2. 3 GHz Pentium 4 processor with 5 GB of RAM
 3. Microsoft Windows 2000 Server[®] operating system
 4. 10/100MBPS Ethernet NIC
 5. 500 GB hard disk
 6. CD-RW drive
 7. High resolution (minimum 1024 x 768), 21" flat panel display
 8. Mouse, full function keyboard
 9. License agreement for all applicable software.
- D. Web-Based Operator PC Requirements
1. Any user on the network can access the system, using the following software:
 2. Windows 10
 3. Internet Explorer 11 and above
 4. Java-enabled
- E. Modem
1. Provide one Windows 10-compatible 56 Kbaud modem for dial-in diagnostics.
- F. Administration and Programming Workstation Software
1. General Description
 - a. The software architecture must be object-oriented in design, a true 32-bit application suite utilizing Microsoft's OLE, COM, DCOM and ODBC technologies. These technologies make it easy to fully utilize the power of the operating system to share, among applications (and therefore to the users of those applications), the wealth of data available from the BAS.
 - b. The workstation functions shall include monitoring and programming of all DDC controllers. Monitoring consists of alarming, reporting, graphic displays, long term data storage,

- automatic data collection, and operator-initiated control actions such as schedule and setpoint adjustments.
- c. Programming of controllers shall be capable of being done either off-line or on-line from any operator workstation. All information will be available in graphic or text displays. Graphic displays will feature animation effects to enhance the presentation of the data, to alert operators of problems, and to facilitate location of information throughout the DDC system. All operator functions shall be selectable through a mouse.
2. System Database
 - a. The files server database engine must be Microsoft SQL Server, or another ODBC-compliant, relational database program. This ODBC (Open Database Connectivity)-compliant database engine allows for an owner to write custom applications and/or reports which communicate directly with the database avoiding data transfer routines to update other applications. The system database shall contain all point configurations and programs in each of the controllers that have been assigned to the network. In addition, the database will contain all workstation files including color graphic, alarm reports, text reports, historical data logs, schedules, and polling records.
 3. User Interface
 - a. The BAS workstation software shall allow the creation of a custom, browser-style interface linked to the user that has logged into the workstation software. This interface shall support the creation of "hot-spots" that the user may link to view/edit any object in the system or run any object editor or configuration tool contained in the software. Furthermore, this interface must be able to be configured to become a user's "PC Desktop" - with all the links that a user needs to run other applications. This, along with the Windows XP user security capabilities, will enable a system administrator to setup workstation accounts that not only limit the capabilities of the user within the BAS software but may also limit what a user can do on the PC and/or LAN/WAN. This might be used to ensure, for example, that the user of an alarm monitoring workstation is unable to shutdown the active alarm viewer and/or unable to load software onto the PC.
 4. User Security
 - a. The software shall be designed so that each user of the software can have a unique username and password. This username/password combination shall be linked to a set of capabilities within the software, set by and editable only by, a system administrator. The sets of capabilities shall range from View only, Acknowledge alarms, Enable/disable and change values, Program, and Administer. The system shall allow the above capabilities to be applied independently to each and every class of object in the system. The system must allow a minimum of 256 users to be configured per workstation. There shall be an inactivity timer adjustable in software that automatically logs off the current operator after the timer has expired.
 5. Configuration Interface
 - a. The workstation software shall use a familiar Windows Explorer-style interface for an operator or programmer to view and/or edit any object (controller, point, alarm, report, schedule, etc.) in the entire system. In addition, this interface shall present a "network map" of all controllers and their associated points, programs, graphics, alarms, and reports in an easy to understand structure. All object names shall be alphanumeric and use Windows long filename conventions.
 - b. The configuration interface shall also include support for template objects. These template objects shall be used as building blocks for the creation of the BAS database. The types of template objects supported shall include all data point types (input, output, string variables, setpoints, etc.), alarm algorithms, alarm notification objects, reports, graphics displays, schedules, and programs. Groups of template object types shall be able to be set up as template subsystems and systems. The template system shall prompt for data entry if necessary. The template system shall maintain a link to all "child" objects created by each template. If a user wishes to make a change to a template object, the software shall ask the user if he/she wants to update all of the child objects with the change. This template system

shall facilitate configuration and programming consistency and afford the user a fast and simple method to make global changes to the BAS.

6. Color Graphic Displays
 - a. The system shall allow for the creation of user defined, color graphic displays for the viewing of mechanical and electrical systems, or building schematics. These graphics shall contain point information from the database including any attributes associated with the point (engineering units, etc.). In addition operators shall be able to command equipment or change setpoints from a graphic through the use of the mouse. Requirements of the color graphic subsystem include:
 - b. SVGA, bit-mapped displays. The user shall have the ability to import AutoCAD generated picture files as background displays.
 - c. A built-in library of animated objects such as dampers, fans, pumps, buttons, knobs, gauges, and graphs which can be “dropped” on a graphic through the use of a software configuration “wizard”. These objects shall enable operators to interact with the graphic displays in a manner that mimics their mechanical equivalents found on field installed control panels. Using the mouse, operators shall be able to adjust setpoints, start or stop equipment, modify PID loop parameters, or change schedules.
 - d. Status changes or alarm conditions must be able to be highlighted by objects changing screen location, size, color, text, blinking or changing from one display to another.
 - e. Ability to link graphic displays through user defined objects, alarm testing, or the result of a mathematical expression. Operators must be able to change from one graphic to another by selecting an object with a mouse - no menus will be required.
 - f. If separate, provide a copy of the full graphic editing software on each workstation.
7. Automatic monitoring
 - a. The software shall allow for the automatic collection of data and reports from any controller through either a hardwire or modem communication link. The frequency of data collection shall be completely user-configurable.
8. Alarm Management
 - a. The software shall be capable of accepting alarms directly from controllers, or generating alarms based on evaluation of data in controllers and comparing to limits or conditional equations configured through the software. Any alarm (regardless of its origination) will be integrated into the overall alarm management system and will appear in all standard alarm reports, be available for operator acknowledgment, and have the option for displaying graphics, or reports.
 - b. Alarm management features shall include:
 - c. A minimum of 255 alarm notification levels. Each notification level will establish a unique set of parameters for controlling alarm display, acknowledgment, keyboard annunciation, alarm printout and record keeping.
 - d. Automatic logging in the database of the alarm message, point name, point value, connected controller, timestamp, username and time of acknowledgement, username and time of alarm silence (soft acknowledgement)
 - e. Automatic printing of the alarm information or alarm report to an alarm printer or report printer.
 - f. Playing an audible beep or audio (wav) file on alarm initiation or return to normal.
 - g. Sending an email or alphanumeric page to anyone listed in a workstation’s email account address list on either the initial occurrence of an alarm and/or if the alarm is repeated because an operator has not acknowledged the alarm within a user-configurable timeframe. The ability to utilize email and alphanumeric paging of alarms shall be a standard feature of the software integrated with the operating system’s mail application interface (MAPI). No special software interfaces shall be required.
 - h. Individual alarms shall be able to be re-routed to a workstation or workstations at user-specified times and dates. For example, a critical high temp alarm can be configured to be routed to a Facilities Dept. workstation during normal working hours (7am-6pm, Mon-Fri) and to a Central Alarming workstation at all other times.

- i. An active alarm viewer shall be included which can be customized for each user or user type to hide or display any alarm attributes.
 - j. The font type and color, and background color for each alarm notification level as seen in the active alarm viewer shall be customizable to allow easy identification of certain alarm types or alarm states.
 - k. The active alarm viewer can be configured such that an operator must type in text in an alarm entry and/or pick from a drop-down list of user actions for certain alarms. This ensures accountability (audit trail) for the response to critical alarms.
9. Custom Report Generation
- a. The software will contain a built-in custom report generator, featuring word processing tools for the creation of custom reports. These custom reports shall be able to be set up to automatically run or be generated on demand. Each workstation shall be able to associate reports with any word processing or spreadsheet program loaded on the machine. When the report is displayed, it will automatically spawn the associated report editor such as MS Word.
 - b. Reports can be of any length and contain any point attributes from any controller on the network.
 - c. The report generator will have access to the user programming language in order to perform mathematical calculations inside the body of the report, control the display output of the report, or prompt the user for additional information needed by the report.
 - d. It shall be possible to run other executable programs whenever a report is initiated.
 - e. Report Generator activity can be tied to the alarm management system, so that any of the configured reports can be displayed in response to an alarm condition.
 - f. Standard reports shall include:
 - 1) Points in each controller.
 - 2) Points in alarm
 - 3) Disabled points
 - 4) Overridden points
 - 5) Operator activity report
 - 6) Alarm history log.
 - 7) Program listing by controller with status.
 - 8) Network status of each controller
10. Spreadsheet-style reports
- a. The software shall allow the simple configuration of row/column (spreadsheet-style) reports on any class of object in the system. These reports shall be user-configurable and shall be able to extract live (controller) data and/or data from the database. The user shall be able to set up each report to display in any text font, color and background color. In addition the report shall be able to be configured to filter data, sort data and highlight data which meets user-defined criteria.
11. HTML Reporting
- a. The above spreadsheet-style reports shall be able to be run to an HTML template file. This feature will create an HTML "results" file in the directory of the HTML template. This directory can be shared with other computer users, which will allow those users with access to the directory to "point" their web browser at the file and view the report.
12. Scheduling
- a. It shall be possible to configure and download from the workstation schedules for any of the controllers on the network.
 - b. Time of day schedules shall be in a calendar style and shall be programmable for a minimum of one year in advance. Each standard day of the week and user-defined day types shall be able to be associated with a color so that when the schedule is viewed it is very easy, at-a-glance, to determine the schedule for a particular day even from the yearly view. To change the schedule for a particular day, a user shall simply click on the day and then click on the day type.

- c. Each schedule will appear on the screen viewable as the entire year, monthly, week and day. A simple mouse click shall allow switching between views. It shall also be possible to scroll from one month to the next and view or alter any of the schedule times.
 - d. Schedules will be assigned to specific controllers and stored in their local RAM memory. Any changes made at the workstation will be automatically updated to the corresponding schedule in the controller.
 - 13. Programmer's Environment
 - a. The programmer's environment will include access to a superset of the same programming language supported in the controllers. Here the programmer will be able to configure application software off-line (if desired) for custom program development, write global control programs, system reports, wide area networking data collection routines, and custom alarm management software. On the same screen as the program editor, the programming environment shall include dockable debug and watch bars for program debugging and viewing updated values and point attributes during programming. In addition a wizard tool shall be available for loading programs from a library file in the program editor.
 - 14. Saving/Reloading
 - a. The workstation software shall have an application to save and restore field controller memory files. This application shall not be limited to saving and reloading an entire controller - it must also be able to save/reload individual objects in the controller. This allows off-line debugging of control programs, for example, and then reloading of just the modified information.
 - 15. Data Logging
 - a. The workstation software shall have the capability to easily configure groups of data points with trend logs and display the trend log data. A group of data points shall be created by drag-and-drop method of the points into a folder. The trend log data shall be displayed through a simply menu selection, or from a hot spot on a graphic display. This data shall be able to be saved to file and/or printed.
 - 16. Audit Trail
 - a. The workstation software shall automatically log and timestamp every operation that a user performs at a workstation, from logging on and off a workstation to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.
 - 17. Fault Tolerant File Server Operation
 - a. The system shall provide the option to provide fault tolerant operation in the event of the loss of the CPU, disk drives, or other hardware required to maintain the operational integrity of the system. Operational integrity includes all user interfaces, monitoring of alarm points and access points, and executing access control functions.
 - b. The switchover mechanism provided shall be automatic. Should the failure be caused by hardware, then the system shall immediately switch to the Backup computer. Should the system failure be caused by software (instruction or data), the system shall not pass the faulted code to the Backup computer, otherwise the Backup shall fail in the same manner of the Primary computer.
 - c. Switchover to the Backup computer shall be initiated and effective (complete) in a manner and time frame that precludes the loss of event data, and shall be transparent to the system users, except for an advisory alarm message indicating that the switchover has occurred.
 - d. When the system fails-over from the Primary to the Backup computer, no alarm or other event shall be lost, and the Backup computer shall take control of all system functions.
 - e. A single component failure in the system shall not cause the entire system to fail. All system users shall be informed of any detectable component failure via an alarm event. System users shall not be logged off as a result of a system failure or switchover.
 - f. The Primary computer shall provide continual indication that the Backup computer is unavailable until such time that the fault has been purged.
- G. Web-based Operator Software

1. Day-to-day operation of the system shall be accessible through a standard web browser interface, allowing technicians and operators to view any part of the system from anywhere on the network. Access to the system must be available from a dial-in connection over the Internet.
2. Graphic Displays
 - a. The browser-based interface must share the same graphical displays as the Administration and Programming Workstations, presenting dynamic data on site layouts, floor plans, and equipment graphics. The browser's graphics shall support commands to change setpoints, enable/disable equipment and start/stop equipment.
 - b. Through the browser interface, operators must be able to navigate through the entire system, and change the value or status of any point in any controller. Changes are effective immediately to the controller, with a copy stored in the system database.
3. Alarm Management
 - a. Through the browser interface, a live alarm viewer identical to the alarm viewer on the Administration and Programming workstation shall be presented, if the user's password allows it. Users must be able to receive alarms, silence alarms, and acknowledge alarms through a browser. If desired, specific operator text must be able to be added to the alarm record before acknowledgement.
4. Groups and Schedules
 - a. Through the browser interface, operators must be able to view pre-defined groups of points, with their values updated automatically.
 - b. Through the browser interface, operators must be able to change schedules - change start and stop times, and add new times to a schedule.
5. User Accounts and Audit Trail
 - a. The same user accounts shall be used for the browser interface and for the operator workstations. Operators must not be forced to memorize multiple passwords.
 - b. All commands and user activity through the browser interface shall be recorded in the system's activity log, which can be later searched and retrieved by user, date, or both.

3.07 DDC SENSORS AND POINT HARDWARE

- A. Temperature Sensors
 1. All temperature devices shall use precision thermistors accurate to +/- 1 degree F over a range of - 30 to 230 degrees F. Space temperature sensors shall be accurate to +/- .5 degrees F over a range of 40 to 100 degrees F.
 2. Standard space sensors shall be available in an off white enclosure for mounting on a standard electrical box.
 3. Where manual overrides are required, the sensor housing shall feature both an optional sliding mechanism for adjusting the space temperature setpoint, as well as a push button for selecting after hours operation.
 4. Where a local display is specified, the sensor shall incorporate either an LED or LCD display for viewing the space temperature, setpoint and other operator selectable parameters. Using built in buttons, operators shall be able to adjust setpoints directly from the sensor.
 5. Duct temperature sensors shall incorporate a thermistor bead embedded at the tip of a stainless steel tube. Probe style duct sensors are useable in air handling applications where the coil or duct area is less than 14 square feet.
 6. Averaging sensors shall be employed in ducts which are larger than 14 square feet. The averaging sensor tube must contain at least one thermistor for every 3 feet, with a minimum tube length of 12 feet.
 7. Immersion sensors shall be employed for measurement of temperature in all chilled and hot water applications as well as refrigerant applications. Thermal wells shall be brass or stainless steel for non-corrosive fluids below 250 degrees F and 300 series stainless steel for all other applications.
 8. A pneumatic signal shall not be allowed for sensing temperature.
- B. Humidity Sensors
 1. Humidity devices shall be accurate to +/- 5% at full scale for space and +/- 3% for duct and outside air applications. Suppliers shall be able to demonstrate that accuracy is NIST traceable.

2. Provide a hand held field calibration tool that both reads the output of the sensor and contains a reference sensor for ongoing calibration.
- C. Pressure Sensors
 1. Air pressure measurements in the range of 0 to 10" water column will be accurate to +/- 1% using a solid-state sensing element. Acceptable manufacturers include Modus Instruments and Mamac.
 2. Differential pressure measurements of liquids or gases shall be accurate to +/- 0.5% of range. The housing shall be Nema 4 rated.
- D. Current and KW Sensors
 1. Current status switches shall be used to monitor fans, pumps, motors and electrical loads. Current switches shall be available in solid and split core models, and offer either a digital or an analog signal to the automation system. Acceptable manufacturer is Veris or approved equal.
 2. Measurement of three phase power shall be accomplished with a kW/kWH transducer. This device shall utilize direct current transformer inputs to calculate the instantaneous value (kW) and a pulsed output proportional to the energy usage (kWH). Provide Veris Model 6000 Power Transducer or approved equal.
- E. Flow Sensors
 1. Provide an insertion vortex flowmeter for measurement of liquid, gas or steam flows in pipe sizes above 3 inches.
 2. Install the flow meter on an isolation valve to permit removal without process shutdown.
 3. Sensors shall be manufactured by EMCO or approved equal.
- F. Control Valves
 1. Provide automatic control valves suitable for the specified controlled media (steam, water or glycol). Provide valves which mate and match the material of the connected piping. Equip control valves with the actuators of required input power type and control signal type to accurately position the flow control element and provide sufficient force to achieve required leakage specification.
 2. Control valves shall meet the heating and cooling loads specified, and close off against the differential pressure conditions within the application. Valves should be sized to operate accurately and with stability from 10 to 100% of the maximum design flow.
 3. Trim material shall be stainless steel for steam and high differential pressure applications.
 4. Electric actuation should be provided on all terminal unit reheat applications.
- G. Dampers
 1. Automatic dampers, furnished by the Building Automation Contractor shall be single or multiple blade as required. Dampers are to be installed by the HVAC Contractor under the supervision of the BAS Contractor. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the Sheet Metal Contractor.
 2. Damper frames are to be constructed of 13 gauge galvanized sheet steel mechanically joined with linkage concealed in the side channel to eliminate noise as friction. Compressible spring stainless steel side seals, and acetal or bronze bearings shall also be provided.
 3. Damper blade width shall not exceed eight inches. Seals and 3/8 inch square steel zinc plated pins are required. Blade rotation is to be parallel or opposed as shown on the schedules.
 4. For high performance applications, control dampers will meet or exceed the UL Class I leakage rating.
 5. Control and smoke dampers shall be Ruskin, or approved equal.
 6. Provide opposed blade dampers for modulating applications and parallel blade for two position control.
- H. Damper Actuators
 1. Damper actuators shall be electronic, and shall be direct coupled over the shaft, without the need for connecting linkage. The actuator shall have electronic overload circuitry to prevent damage. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Non-spring return actuators shall have an external manual gear release to allow positioning of the damper when the actuator is not powered.

I. Smoke Detectors

1. Air duct smoke detectors shall be by Air Products & Controls or approved equal. The detectors shall operate at air velocities from 300 feet per minute to 4000 feet per minute.
2. The smoke detector shall utilize a photoelectric detector head.
3. The housing shall permit mechanical installation without removal of the detector cover.
4. The detectors shall be listed by Underwrites Laboratories and meet the requirements of UL 268A.

J. Airflow Measuring Stations

1. Provide a thermal anemometer using instrument grade self heated thermistor sensors with thermistor temperature sensors.
2. The flow station shall operate over a range of 0 to 5,000 feet/min with an accuracy of +/- 2% over 500 feet/min and +/- 10 ft/min for reading less than 500 feet/min.
3. The output signal shall be linear with field selectable ranges including 0-5 VDC, 0-10VDC and 4-20 mA.

PART 4 - EXECUTION

4.01 CONTRACTOR RESPONSIBILITIES

A. General

1. Installation of the building automation system shall be performed by the Contractor or a subcontractor. However, all installation shall be under the personal supervision of the Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor.

B. Demolition

1. Remove controls which do not remain as part of the building automation system, all associated abandoned wiring and conduit, and all associated pneumatic tubing. The Owner will inform the Contractor of any equipment which is to be removed that will remain the property of the Owner. All other equipment which is removed will be disposed of by the Contractor.

C. Access to Site

1. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the Owner or the Owner's Representative.

D. Code Compliance

1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations. Should any discrepancy be found between wiring specifications in Division 17 and Division 16, wiring requirements of Division 17 will prevail for work specified in Division 17.

E. Cleanup

1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

4.02 WIRING, CONDUIT, AND CABLE

- A. All wire will be copper and meet the minimum wire size and insulation class listed below:

WIRE CLASS	WIRE SIZE	ISOLATION CLASS
POWER	12 GAUGE	600 VOLT
CLASS ONE	14 GAUGE STD.	600 VOLT
CLASS TWO	18 GAUGE STD.	300 VOLT
CLASS THREE	18 GAUGE STD.	300 VOLT
COMMUNICATIONS	PER MFR.	PER MFR.

- A. Power and Class One wiring may be run in the same conduit. Class Two and Three wiring and communications wiring may be run in the same conduit.

- B. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per the National Electric Code.
- C. Where wiring is required to be installed in conduit, EMT shall be used. Conduit shall be minimum 1/2 inch galvanized EMT. Set screw fittings are acceptable for dry interior locations. Watertight compression fittings shall be used for exterior locations and interior locations subject to moisture. Provide conduit sealoff fitting where exterior conduits enter the building or between areas of high temperature/moisture differential.
- D. Flexible metallic conduit (max. 3 feet) shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment. Liquid-tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.
- E. Junction boxes shall be provided at all cable splices, equipment termination, and transitions from EMT to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasketed covers.
- F. Where the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated. Teflon wiring can be run without conduit above suspended ceilings. EXCEPTION: Any wire run in suspended ceilings that is used to control outside air dampers or to connect the system to the fire management system shall be in conduit.
- G. Fiber optic cable shall include the following sizes; 50/125, 62.5/125 or 100/140.
- H. Only glass fiber is acceptable, no plastic.
- I. Fiber optic cable shall only be installed and terminated by an experienced contractor. The BAS contractor shall submit to the Engineer the name of the intended contractor of the fiber optic cable with his submittal documents.

4.03 HARDWARE INSTALLATION

- A. Installation Practices for Wiring
 - 1. All controllers are to be mounted vertically and per the manufacturer's installation documentation .
 - 2. The 120VAC power wiring to each Ethernet or Remote Site controller shall be a dedicated run, with a separate breaker. Each run will include a separate hot, neutral and ground wire. The ground wire will terminate at the breaker panel ground. This circuit will not feed any other circuit or device.
 - 3. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel.
 - 4. Wires are to be attached to the building proper at regular intervals such that wiring does not droop. Wires are not to be affixed to or supported by pipes, conduit, etc.
 - 5. Conduit in finished areas, will be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction. Exception; metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.
 - 6. Conduit, in non-finished areas where possible, will be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction. Exposed conduit will run parallel to or at right angles to the building structure.
 - 7. Wires are to be kept a minimum of three (3) inches from hot water, steam, or condensate piping.
 - 8. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.
 - 9. Wire will not be allowed to run across telephone equipment areas.
- B. Installation Practices for Field Devices
 - 1. Well-mounted sensors will include thermal conducting compound within the well to insure good heat transfer to the sensor.
 - 2. Actuators will be firmly mounted to give positive movement and linkage will be adjusted to give smooth continuous movement throughout 100 percent of the stroke.
 - 3. Relay outputs will include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.

4. Water line mounted sensors shall be removable without shutting down the system in which they are installed.
 5. For duct static pressure sensors, the high pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low pressure port shall be left open to the plenum area at the point that the high pressure port is tapped into the ductwork.
 6. For building static pressure sensors, the high pressure port shall be inserted into the space via a metal tube. Pipe the low pressure port to the outside of the building.
- C. Enclosures
1. For all I/O requiring field interface devices, these devices where practical will be mounted in a field interface panel (FIP). The Contractor shall provide an enclosure which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.
 2. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.
 3. The FIP enclosure shall be of steel construction with baked enamel finish, NEMA 1 rated with a hinged door and keyed lock. The enclosure will be sized for twenty percent spare mounting space. All locks will be keyed identically.
 4. All wiring to and from the FIP will be to screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.
 5. All outside mounted enclosures shall meet the NEMA-4 rating.
 6. The wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.
- D. Identification
1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
 2. All field enclosures, other than controllers, shall be identified with a bakelite nameplate. The lettering shall be in white against a black or blue background.
 3. Junction box covers will be marked to indicate that they are a part of the BAS system.
 4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
 5. All I/O field devices inside FIP's shall be labeled.

4.04 EXISTING CONTROLS.

- A. Existing controls which are to be reused must each be tested and calibrated for proper operation. Existing controls which are to be reused and are found to be defective requiring replacement, will be noted to the Owner. The Owner will be responsible for all material and labor costs associated with their repair.

4.05 CONTROL SYSTEM SWITCH-OVER

- A. Demolition of the existing control system will occur after the new temperature control system is in place including new sensors and new field interface devices.
- B. Switch-over from the existing control system to the new system will be fully coordinated with the Owner. A representative of the Owner will be on site during switch-over.
- C. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be accomplished in a reasonable time frame.

4.06 LOCATION

- A. The location of sensors is per mechanical and architectural drawings.
- B. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.
- C. Outdoor air sensors will be mounted on the north building face directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized.
- D. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

PART 5 - SOFTWARE INSTALLATION

5.01 GENERAL.

- A. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third party software necessary for successful operation of the system.

5.02 DATABASE CONFIGURATION.

- A. The Contractor will provide all labor to configure those portions of the database that are required by the points list and sequence of operation.

5.03 COLOR GRAPHIC DISPLAYS.

- A. Unless otherwise directed by the owner, the Contractor will provide color graphic displays as depicted in the mechanical drawings for each system and floor plan. For each system or floor plan, the display shall contain the associated points identified in the point list and allow for setpoint changes as required by the owner.

5.04 REPORTS.

- A. The Contractor will configure a minimum of 6 reports for the owner as listed below:
 - 1. Central Plant Status Report
 - 2. Air Handler Status Report
 - 3. Energy Consumption Report
 - 4. Space Temperature Report
 - 5. Specialty Equipment Status Report

5.05 DOCUMENTATION

- A. As built software documentation will include the following:
 - 1. Descriptive point lists
 - 2. Application program listing
 - 3. Application programs with comments.
 - 4. Printouts of all reports.
 - 5. Alarm list.
 - 6. Printouts of all graphics

5.06 COMMISSIONING AND SYSTEM STARTUP

- A. Point to Point Checkout.
 - 1. Each I/O device (both field mounted as well as those located in FIPs) shall be inspected and verified for proper installation and functionality. A checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager for submission to the owner or owner's representative.
- B. Controller and Workstation Checkout.
 - 1. A field checkout of all controllers and front end equipment (computers, printers, modems, etc.) shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the owner or owner's representative by the completion of the project.

5.07 SYSTEM ACCEPTANCE TESTING

- A. All application software will be verified and compared against the sequences of operation. Control loops will be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint. Record all test results and attach to the Test Results Sheet.
- B. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit a Test Results Sheet to the owner.

- C. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended. Submit a Test Results Sheet to the owner.
- D. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

5.08 SEQUENCES OF OPERATION

- A. Boiler Control
- B. Single Zone Air Handlers
- C. Fan Coil Control

END OF SECTION

SECTION 23 2220
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water piping, above grade.
- C. Equipment drains and overflows.
- D. Pipe hangers and supports.
- E. Unions, flanges, mechanical couplings, and dielectric connections.
- F. Valves:
 - 1. Ball valves.
 - 2. Butterfly valves.
 - 3. Check valves.
- G. Flow controls.

1.02 REFERENCE STANDARDS

- A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- E. ASME B31.9 - Building Services Piping; 2014.
- F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- G. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2015.
- H. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts; 2014.
- I. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2017.
- J. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
- K. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.
- L. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications; 2012.
- M. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2015.
- N. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2015.
- O. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2015.
- P. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015.
- Q. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2014).
- R. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2013).

- S. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.
- T. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (with March 2016 Errata).
- U. AWWA C606 - Grooved and Shouldered Joints; 2015.
- V. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.
- C. Product Data:
 - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
 - 2. Indicate valve data and ratings.
- D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- E. Project Record Documents: Record actual locations of valves.

1.04 QUALITY ASSURANCE

- A. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.
- B. Date stamp all castings used for coupling housings, fittings, valve bodies, etc. for quality assurance and traceability.
- C. Welder Qualifications: Certify in accordance with ASME BPVC-IX.
 - 1. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
 - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
 - 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
 - 3. Grooved mechanical joints may be used in accessible locations only.
 - a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
 - b. Grooved mechanical connections and joints comply with AWWA C606.
 - 1) Ductile Iron: Comply with ASTM A536, Grade 65-45-12.
 - 2) Steel: Comply with ASTM A106/A106M, Grade B or ASTM A53/A53M.
 - c. Use rigid joints unless otherwise indicated.
 - d. Use gaskets of molded synthetic rubber with central cavity, pressure responsive configuration and complying with ASTM D2000, Grade 2CA615A15B44F17Z for circulating medium up to maximum 230 degrees F (110 degrees C) or Grade M3BA610A15B44Z for circulating medium up to maximum 200 degrees F (93 degrees C).
 - e. Provide steel coupling nuts and bolts complying with ASTM A183.
 - 4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
 - 1. Where grooved joints are used in piping, provide grooved valve/equipment connections if available; if not available, provide flanged ends and grooved flange adapters.
- D. Valves: Provide valves where indicated:
 - 1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch (20 mm) gate valves with cap; pipe to nearest floor drain.
 - 2. Isolate equipment using butterfly valves with lug end flanges or grooved mechanical couplings.
 - 3. For bypass, or manual flow control services, use globe or ball valves.
 - 4. In heating water systems, butterfly valves may be used interchangeably with gate and globe valves.
 - 5. For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.
 - 6. For throttling service, use plug cocks. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.
- E. Welding Materials and Procedures: Conform to ASME BPVC-IX.

2.02 HEATING WATER AND GLYCOL PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
 - 1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: ASME B16.3, malleable iron fittings.
 - 3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
- B. Steel Pipe Sizes 12 Inch (305 mm) and Greater: ASTM A53/A53M, 3/8 inch (9.5 mm) wall, black, using one of the following joint types:
 - 1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: ASTM A536 ductile iron fittings.
 - 3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

2.03 EQUIPMENT DRAINS AND OVERFLOWS

- A. Steel Pipe: ASTM A53/A53M, Schedule 40 galvanized; using one of the following joint types:
 - 1. Threaded Joints: Galvanized cast iron, or ASME B16.3 malleable iron fittings.
- B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
 - 1. Fittings: ASTM D2466 or D2467, PVC.
 - 2. Joints: Solvent welded in accordance with ASTM D2855.

2.04 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron, adjustable swivel, split ring.
 - 3. Hangers for Hot Pipe Sizes 2 to 4 Inches (50 to 100 mm): Carbon steel, adjustable, clevis.
 - 4. Hangers for Hot Pipe Sizes 6 Inches (150 mm) and Greater: Adjustable steel yoke, cast iron roll, double hanger.
 - 5. Wall Support for Pipe Sizes to 3 Inches (76 mm): Cast iron hook.
 - 6. Wall Support for Pipe Sizes 4 Inches (100 mm) and Greater: Welded steel bracket and wrought steel clamp.
 - 7. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 8. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.05 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe 2 Inches (50 mm) and Less:
- B. Flanges for Pipe 2 Inches (50 mm) and Greater:
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
 - 1. Dimensions and Testing: In accordance with AWWA C606.
 - 2. Mechanical Couplings: Comply with ASTM F1476.
 - 3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
 - 4. When pipe is field grooved, provide coupling manufacturer's grooving tools.
 - 5. Manufacturers:
 - a. Grinnell Products, a Tyco Business: www.grinnell.com.
 - b. Victaulic Company: www.victaulic.com.
 - c. or approved equal.
- D. Dielectric Connections:
 - 1. Waterways:
 - a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
 - b. Dry insulation barrier able to withstand 600 volt breakdown test.
 - c. Construct of galvanized steel with threaded end connections to match connecting piping.
 - d. Suitable for the required operating pressures and temperatures.
 - 2. Flanges:
 - a. Dielectric flanges with same pressure ratings as standard flanges.
 - b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
 - c. Dry insulation barrier able to withstand 600 volt breakdown test.
 - d. Construct of galvanized steel with threaded end connections to match connecting piping.
 - e. Suitable for the required operating pressures and temperatures.

2.06 BALL VALVES

- A. Manufacturers:
 - 1. Grinnell Products, a Tyco Business: www.grinnell.com.
 - 2. Victaulic Company: www.victaulic.com.
 - 3. or approved equal.
- B. Up To and Including 2 Inches (50 mm):
 - 1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.
- C. Over 2 Inches (50 mm):
 - 1. Ductile iron body, chrome plated stainless steel ball, teflon or Virgin TFE seat and stuffing box seals, lever handle, flanged ends, rated to 800 psi (5515 kPa).

2.07 BUTTERFLY VALVES

- A. Manufacturers:
 - 1. Grinnell Products, a Tyco Business: www.grinnell.com.
 - 2. Victaulic Company: www.victaulic.com.
 - 3. or approved equal.
- B. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck.
- C. Disc: Construct of chrome plated ductile iron, stainless steel, or ductile iron with EPDM encapsulation.
- D. Stem: Stainless steel with stem offset from the centerline to provide full 360 degree circumferential setting.
- E. Operator: 10 position lever handle.

2.08 SWING CHECK VALVES

- A. Manufacturers:
 - 1. Grinnell Products, a Tyco Business: www.grinnell.com.
 - 2. Victaulic Company: www.victaulic.com.
 - 3. or approved equal.
- B. Up To and Including 2 Inches (50 mm):
 - 1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.
- C. Over 2 Inches (50 mm):
 - 1. Iron body, bronze trim, stainless steel or bronze swing disc, renewable disc and seat, flanged or grooved ends.

2.09 FLOW CONTROLS

- A. Manufacturers:
 - 1. Griswold Controls: www.griswoldcontrols.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. Taco, Inc: www.taco-hvac.com.
 - 4. Victaulic Company: www.victaulic.com.
 - 5. or approved equal.
- B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.
- C. Remove scale and dirt on inside and outside before assembly.
- D. Prepare piping connections to equipment using jointing system specified.
- E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- F. After completion, fill, clean, and treat systems. Refer to Section 23 2500 for additional requirements.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space and to avoid interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls and floors.
- G. Slope piping and arrange to drain at low points.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 0516.
- I. Grooved Joints:
 - 1. Install in accordance with the manufacturer's latest published installation instructions.
 - 2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.
- J. Inserts:
 - 1. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

- K. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch (38 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Prime coat exposed steel hangers and supports. Refer to Section 09 9123. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- L. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 0719.
- M. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 0719.
- N. Use eccentric reducers to maintain top of pipe level.
- O. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- P. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. Refer to Section 09 9123.
- Q. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

- A. Hanger Spacing for Steel Piping.
 - 1. 1/2 inch (15 mm), 3/4 inch (20 mm), and 1 inch (25 mm): Maximum span, 7 feet (2100 mm); minimum rod size, 1/4 inch (6 mm).
 - 2. 1-1/4 inches (32 mm): Maximum span, 8 feet (2400 mm); minimum rod size, 3/8 inch (9 mm).
 - 3. 1-1/2 inches (40 mm): Maximum span, 9 feet (2700 mm); minimum rod size, 3/8 inch (9 mm).
 - 4. 2 inches (50 mm): Maximum span, 10 feet (3.0 m); minimum rod size, 3/8 inch (9 mm).
 - 5. 2-1/2 inches (65 mm): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (9 mm).
 - 6. 3 inches (80 mm): Maximum span, 12 feet (3.6 m); minimum rod size, 3/8 inch (9 mm).
 - 7. 4 inches (100 mm): Maximum span, 14 feet (4.3 m); minimum rod size, 1/2 inch (13 mm).
 - 8. 6 inches (150 mm): Maximum span, 17 feet (5.1 m); minimum rod size, 1/2 inch (13 mm).

END OF SECTION

SECTION 23 2221
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Expansion tanks.
- B. Air vents.
- C. Air separators.
- D. Strainers.
- E. Suction diffusers.
- F. Pump connectors.
- G. Combination pump discharge valves.
- H. Pressure-temperature test plugs.
- I. Balancing valves.
- J. Combination flow controls.
- K. Flow meters.
- L. Relief valves.
- M. Pressure reducing valves.

1.02 RELATED REQUIREMENTS

- A. Section 22 2113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

- A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.
- B. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2013.
- C. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 EXPANSION TANKS

- A. Manufacturers:
 - 1. Amtrol Inc: www.amtrol.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. Taco, Inc: www.taco-hvac.com.
 - 4. or approved equal.
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psi (860 kPa), with flexible EPDM diaphragm or bladder sealed into tank, and steel support stand.

- C. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psi (80 kPa).
- D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

2.02 AIR VENTS

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. Taco, Inc: www.taco-hvac.com.
 - 4. or approved equal.
- B. Manual Type: Short vertical sections of 2 inch (50 mm) diameter pipe to form air chamber, with 1/8 inch (3 mm) brass needle valve at top of chamber.
- C. Float Type:
 - 1. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

2.03 AIR SEPARATORS

- A. Coalescing Air/Dirt Separators:
 - 1. Manufacturers:
 - a. Armstrong International, Inc: www.armstronginternational.com.
 - b. ITT Bell & Gossett: www.bellgossett.com.
 - c. Spirotherm, Inc: www.spirotherm.com.
 - d. or approved equal.
 - 2. Tank: Fabricated steel tank; tested and stamped in accordance with ASME BPVC-VIII-1; for 150 psi (1034 kPa) operating pressure and 270 degrees F (132 degrees C) maximum operating temperature; subject to the requirements of the application and the manufacturer's standard maximum operating conditions.
 - 3. Coalescing Medium: Provide structured copper or stainless steel medium filling the entire vessel to suppress turbulence and provide air elimination efficiency of 100 percent free air, 100 percent entrained air, and 99.6 percent dissolved air at the installed location.
 - 4. Air Vent: Integral float actuated air vent at top fitting of tank rated at 150 psi (1030 kPa), threaded to the top of the separator.
 - 5. Inlet and Outlet Connections: Threaded for 2 NPS (50 DN) and smaller; Class 150 flanged connections for 2-1/2 NPS (65 DN) and larger.
 - 6. Blowdown Connection: Threaded.
 - 7. Size: Match system flow capacity.

2.04 STRAINERS

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com.
 - 2. Flexicraft Industries: www.flexicraft.com.
 - 3. Grinnell Products, a Tyco Business: www.grinnell.com.
 - 4. The Metraflex Company; LPD Y Strainer: www.metralflex.com/#sle.
 - 5. or approved equal.
- B. Size 2 inch (50 mm) and Under:
 - 1. Screwed brass or iron body for 175 psi (1200 kPa) working pressure, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
- C. Size 2-1/2 inch (65 mm) to 4 inch (100 mm):
 - 1. Provide flanged or grooved iron body for 175 psi (1200 kPa) working pressure, Y pattern with 1/16 inch (1.6 mm), or 3/64 inch (1.2 mm) stainless steel perforated screen.
- D. Size 5 inch (125 mm) and Larger:
 - 1. Provide flanged or grooved iron body for 175 psi (1200 kPa) working pressure, basket pattern with 1/8 inch (3.2 mm) stainless steel perforated screen.

2.05 SUCTION DIFFUSERS

- A. Manufacturers:
 - 1. Anvil International, Inc: www.anvilintl.com.
 - 2. Grinnell Products, a Tyco Business: www.grinnell.com.
 - 3. ITT Bell & Gossett: www.bellgossett.com.
 - 4. Victaulic Company of America: www.victaulic.com.
 - 5. or approved equal.
- B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch (50 mm) and smaller, flanged for 2-1/2 inch (65 mm) and larger, rated for 175 psi (1200 kPa) working pressure, with inlet vanes, cylinder strainer with 3/16 inch (5 mm) diameter openings, disposable 5/32 inch (4 mm) mesh strainer to fit over cylinder strainer, 20 mesh start up screen, and permanent magnet located in flow stream and removable for cleaning.
- C. Accessories: Adjustable foot support, blowdown tapping in bottom, gage tapping in side.

2.06 PUMP CONNECTORS

- A. Manufacturers:
 - 1. The Metraflex Company; Vane Flex: www.metroflex.com/#sle.
- B. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
 - 1. Maximum Allowable Working Pressure: 150 psig (1030 kPa) at 120 degrees F (49 degrees C).
 - 2. End Connections: Same as specified for pipe jointing.
 - 3. Provide pump connector with integral vanes to reduce turbulent flow.
 - 4. Provide necessary accessories including, but not limited to, swivel joints.

2.07 COMBINATION PUMP DISCHARGE VALVES

- A. Manufacturers:
 - 1. Crane Co.: www.craneco.com.
 - 2. Taco, Inc: www.taco-hvac.com.
 - 3. Victaulic Company of America: www.victaulic.com.
 - 4. or approved equal.
- B. Valves: Straight or angle pattern, flanged cast-iron valve body with bolt-on bonnet for 175 psi (1200 kPa) operating pressure, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.

2.08 PRESSURE-TEMPERATURE TEST PLUGS

- A. Manufacturers:
 - 1. Ferguson Enterprises Inc: www.fnw.com.
 - 2. Peterson Equipment Company Inc: www.petesplug.com.
 - 3. Sisco Manufacturing Company Inc: www.siscomfg.com.
 - 4. or approved equal.
- B. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F (93 degrees C).
- C. Application: Use extended length plugs to clear insulated piping.

2.09 BALANCING VALVES

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. Taco, Inc: www.taco-hvac.com.
 - 4. or approved equal.
- B. Size 2 inch (50 mm) and Smaller:

1. Provide ball or globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or soldered connections.
 2. Metal construction materials consist of bronze or brass.
 3. Non-metal construction materials consist of Teflon, EPDM, or engineered resin.
- C. Size 2.5 inch (64 mm) and Larger:
1. Provide ball, globe, or butterfly style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and flanged, grooved, or weld end connections.
 2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
 3. Internal components construction materials consist of brass, bronze, Teflon, or NORYL.

2.10 COMBINATION FLOW CONTROLS

- A. Manufacturers:
1. Armstrong International: www.armstronginternational.com
 2. ITT Bell & Gossett: www.bellgossett.com.
 3. Taco Inc: www.taco-hvac.com.
 4. or approved equal.
- B. Construction: Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet.
- C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).
- D. Control Mechanism: Stainless steel or nickel plated brass piston or regulator cup, operating against stainless steel helical or wave formed spring.
1. Accessories: In-line strainer on inlet and ball valve on outlet.

2.11 FLOW METERS

- A. Manufacturers:
1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 2. EMCO Flow Systems: www.emcoflow.com.
 3. or approved equal.
- B. Direct reading with insert pitot tube, threaded coupling, for 150 psi (1034 kPa) working pressure, maximum 240 degrees F (115 degrees C), 5 percent accuracy.
- C. Cast iron, wafer type, orifice insert flow meter for 250 psi (1720 kPa) working pressure, with read-out valves equipped with integral check valves with gasketed caps.
- D. Calibrated, plug type balance valve with precision machined orifice, readout valves equipped with integral check valves and gasketed caps, calibrated nameplate and indicating pointer.

2.12 RELIEF VALVES

- A. Manufacturers:
1. Armstrong International, Inc: www.armstronginternational.com.
 2. ITT Bell & Gossett: www.bellgossett.com.
 3. Conbraco Industries: www.apollovalves.com.
 4. or approved equal.
- B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.13 PRESSURE REDUCING VALVES

- A. Manufacturers:
1. Armstrong International, Inc: www.armstronginternational.com.
 2. ITT Bell & Gossett: www.bellgossett.com.
 3. Taco, Inc: www.taco-hvac.com.
 4. or approved equal.

- B. Operation: Automatically feeds make-up water to the hydronic system whenever pressure in the system drops below the pressure setting of the valve. Refer to Section 22 2113.
- C. Materials of Construction:
 - 1. Valve Body: Constructed of bronze, cast iron, brass, or iron.
 - 2. Internal Components: Construct of stainless steel or brass and engineered plastics or composition material.
- D. Connections:
 - 1. NPT threaded: 0.50 inch (15 mm), or 0.75 inch (20 mm).
 - 2. Soldered: 0.50 inch (15 mm).
- E. Provide integral check valve and strainer.
- F. Maximum Inlet Pressure: 100 psi (689 kPa).
- G. Maximum Fluid Temperature: 180 degrees F (82 degrees C).
- H. Operating Pressure Range: Between 10 psi (69 kPa) and 25 psi (172 kPa).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.
- B. Provide manual air vents at system high points and as indicated.
- C. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- D. Provide air separator on suction side of system circulation pump and connect to expansion tank.
- E. Provide valved drain and hose connection on strainer blow down connection.
- F. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps where indicated.
- G. Support pump fittings with floor mounted pipe and flange supports.
- H. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.
- I. Pipe relief valve outlet to nearest floor drain.

END OF SECTION

SECTION 23 2300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Filter-driers.
- G. Flexible connections.

1.02 REFERENCE STANDARDS

- A. AHRI 495 - Performance Rating of Refrigerant Liquid Receivers; 2005.
- B. AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.
- C. AHRI 750 - Standard for Thermostatic Refrigerant Expansion Valves; 2007.
- D. AHRI 760 - Standard for Performance Rating of Solenoid Valves for Use With Volatile Refrigerants; 2007.
- E. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.
- F. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2013.
- G. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- H. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2013.
- I. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2013.
- J. ASME B31.9 - Building Services Piping; 2014.
- K. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
- L. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.
- M. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2013.
- N. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.
- O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- P. UL 429 - Electrically Operated Valves; Current Edition, Including All Revisions.

1.03 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. Liquid Indicators:
 - 1. Use line size liquid indicators in main liquid line leaving condenser.
 - 2. If receiver is provided, install in liquid line leaving receiver.
 - 3. Use line size on leaving side of liquid solenoid valves.
- D. Valves:
 - 1. Use service valves on suction and discharge of compressors.
- E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

- F. Strainers:
 - 1. Use line size strainer upstream of each automatic valve.
- G. Filter-Driers:
 - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
 - 2. Use a filter-drier on suction line just ahead of compressor.
 - 3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
 - 4. Use sealed filter-driers in low temperature systems.
- H. Solenoid Valves:
 - 1. Use in liquid line of single or multiple evaporator systems.
- I. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 for installation of piping system.

2.02 PIPING

- A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
- B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
 - 1. Fittings: ASME B16.26 cast copper.
 - 2. Joints: Flared.
- C. Pipe Supports and Anchors:
 - 1. Provide hangers and supports that comply with MSS SP-58.
 - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
 - 3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 4. Vertical Support: Steel riser clamp.
 - 5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.03 REFRIGERANT

- A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

2.04 MOISTURE AND LIQUID INDICATORS

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.05 VALVES

- A. Diaphragm Packless Valves:
 - 1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.
- B. Ball Valves:

1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.
- C. Service Valves:
 1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.06 STRAINERS

- A. Straight Line or Angle Line Type:
 1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.07 FILTER-DRIERS

- A. Construction: UL listed.
 1. Sealed Type: Copper shell.
 2. Connections: As specified for applicable pipe type.

2.08 SOLENOID VALVES

- A. Valve: AHRI 760 I-P, pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psi.
- B. Coil Assembly: UL 429, UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

2.09 EXPANSION VALVES

- A. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with non-replaceable capillary tube and remote sensing bulb and remote bulb well.
- B. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

2.10 FLEXIBLE CONNECTORS

- A. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Pipe Hangers and Supports:
 1. Install in accordance with ASME B31.5.
 2. Support horizontal piping as scheduled.
 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 4. Place hangers within 12 inches of each horizontal elbow.

- F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Insulate piping and equipment; refer to Section and Section 23 0716.
- I. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

3.03 FIELD QUALITY CONTROL

- A. Test refrigeration system in accordance with ASME B31.5.

3.04 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
 - 1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 - 2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Duct cleaning.

1.02 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2017.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2016b.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Rev. 2009).

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.04 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply (Heating Systems): 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.
- D. Low Pressure Supply (System with Cooling Coils): 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.
- E. Return and Relief: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.
- F. General Exhaust: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.
- G. Outside Air Intake: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.04 MANUFACTURED DUCTWORK AND FITTINGS

- A. Double Wall Insulated Flat Oval Ducts: Machine made from round spiral lockseam duct.
 - 1. Manufacture in accordance with SMACNA (DCS).
 - 2. Fittings: Manufacture with solid inner wall.
 - 3. Inner Wall: Perforated galvanized steel.
 - 4. Insulation:
 - a. Thickness: 2 inch (50 mm) fiberglass.
- B. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with solid inner wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
 - 2. Insulation:
 - a. Thickness: 2 inch (50 mm).
 - b. Material: Air.
- C. Double Wall Insulated Rectangular Ducts: Rectangular spiral lockseam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with solid inner wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
 - 2. Insulation:
 - a. Thickness: 2 inch (50 mm).
 - b. Material: Air.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

3.02 CLEANING

- A. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct access doors.
- B. Flexible duct connectors.

1.02 RELATED REQUIREMENTS

- A. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Rev. 2009).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Acudor Products Inc, a Division of Nelson Industrial Inc: www.acudor.com.
 - 2. Elgen Manufacturing, Inc: www.elgenmfg.com.
 - 3. Lloyd Industries, Inc: www.firedamper.com/#sle.
 - 4. Nailor Industries, Inc: www.nailor.com.
 - 5. Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
 - 6. SEMCO LLC: www.semcohvac.com.
 - 7. Ward Industries, a brand of Hart and Cooley, Inc: www.wardind.com.
 - 8. or approved equal.

2.02 FLEXIBLE DUCT CONNECTORS

- A. Manufacturers:
 - 1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehvac.com/#sle.
 - 2. Elgen Manufacturing, Inc: www.elgenmfg.com.
 - 3. or approved equal.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 for duct construction and pressure class.

END OF SECTION

SECTION 23 3600
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Unit Ventilators.

1.02 REFERENCE STANDARDS

- A. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; 2001 (R2011).
- B. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2011 with Addendum 1.
- C. ASHRAE Std 62.1 - Laboratory Method of Testing to Determine the Sound Power in a Duct; 2013.
- D. ASHRAE Std 130 - Methods of Testing Air Terminal Units; 2008 (R2014).
- E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2012.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- I. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; Sheet Metal and Air Conditioning Contractors' National Association; 2008.
- J. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
 - 1. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1 to 4 inch wg.
- D. Certificates: Certify that coils are tested and rated in accordance with AHRI 410.
- E. Manufacturer's Installation Instructions: Indicate support and hanging details, installation instructions, recommendations, and service clearances required.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 UNIT VENTILATORS

- A. Manufacturers:
 - 1. Airdale - "Varsity Unit Ventilator"

2. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp.:
www.commercial.carrier.com.
 3. Johnson Controls, Inc: www.johnsoncontrols.com.
 4. Price Industries, Inc: www.priceindustries.com.
 5. Trane, a brand of Ingersoll Rand: www.trane.com.
 6. Tuttle and Bailey: www.tuttleandbailey.com/#sle.
 7. York.
 8. Substitutions: See Section 01 6000 - Product Requirements.
- B. General:
1. Factory-assembled and wired, AHRI 880 (I-P) rated, horizontal fan-powered terminal unit with blower, blower motor, mixing plenum, and primary air damper contained in a single unit housing.
- C. Unit Casing:
1. Minimum 22 gage, 0.0299 inch galvanized steel.
 2. Color choices to be submitted and chosen by District
 3. Primary Air Inlet Collar: Suitable for standard flexible duct sizes.
 4. Acceptable Liners:
 - a. 1/2 inch thick, coated, fibrous-glass complying with ASTM C1071.
 - 1) Secure with adhesive.
 - 2) Coat edges exposed to airstream with NFPA 90A approved sealant.
 - 3) Cover liner with non-porous foil.
- D. Primary Air Damper Assembly:
1. Heavy-gage, galvanized steel or extruded aluminum construction with solid shaft rotating in bearings.
 2. Provide indicator on damper shaft or alternative method for indicating damper position over full range of 90 degrees.
 3. Incorporate low leak (2 percent) damper blades for tight airflow shutoff.
 4. Fan(s): Forward curved, centrifugal type.
 5. Fan Motor:
 - a. Fan motor shaft directly connected to fan and isolated from unit casing to prevent transmission of vibration.
- E. Configuration
1. No Face and bypass damper
 2. Include mixed air damper with actuator
 3. Left Hand Cooling Right Hand Heating
 4. Left Side Electrical Connection
 5. Cabinet colors to be submitted and approved by district
- F. Hot Water Heating Coil:
1. Coil Casing: Minimum 22 gage, 0.0299 inch galvanized steel, factory-installed on terminal unit with flanged discharge for attachment to downstream ductwork.
 2. Heavy-gage aluminum fins, mechanically bonded to tubes.
 3. Copper Tubes: 0.016 inch minimum wall thickness with male solder header connections.
 4. Coil leak tested to minimum 305 psig.
 5. Base performance data on tests run in accordance with AHRI 410.
- G. Electrical Requirements:
1. Single-point power connection.
 2. Equipment wiring to comply with requirements of NFPA 70.
- H. Controls:
1. DDC (Direct-Digital Controls): All new equipment is to be integrated into the existing BMS system. (by JCI)
 - a. Room Sensor: Tie into existing BMS system (by JCI)
 - 1) Compatible with existing temperature controls.

- 2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.
2. Control Sequence: See Section 23 0993.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are suitable for installation.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Connect to ductwork in accordance with Section 23 3100.
- C. Verify that electric power is available and of the correct characteristics.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.04 CLEANING

- A. Vacuum clean coils and inside of units.
- B. Install new filters.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

3.06 SCHEDULES

- A. Fan-Powered Air Terminal Unit:
- B. See Schedule on drawings

END OF SECTION

SECTION 23 3814
KITCHEN MAKE UP AIR UNIT

MODEL: A-IBT

1.01 DESCRIPTION:

An indirect-fired gas heating and ventilating unit(s), as indicated on the drawings shall be furnished. Orientation shall be horizontal (down) (side) (up) discharge. Unit(s) shall be factory assembled, tested and shipped as a complete packaged assembly, for indoor or outdoor mounting, consisting of the following:

- A. Gas furnace;
- B. Centrifugal blower (forward-curved double width/double inlet or backward inclined);
- C. Motor starter with thermal overload protection;
- D. Motor and drive assembly;
- E. Fuel burning and safety equipment;
- F. Temperature control system, and
- G. Gas piping

APPROVALS:

Unit(S) Assembly Shall Be Tested In Accordance With Standard, ANSI Z83.8-2006 And CSA 2.6-2006 And shall Bear The ETL Label. The Duct Furnace Shall Be Certified By The American Gas Association And Approved By The Canadian Gas Association.

1.02 CONSTRUCTION:

Housing Standard

Unit housing shall be constructed of 20 gauge g-90 galvanized steel. The wall panels and roof panels shall be fabricated by forming double-standing, self-locking seams that require no additional support. The floor and wall panels shall be caulked air tight with a silicone caulk. All casing panels shall be attached with sheet-metal screws or rivets, which can be removed to field service large components. The unit base shall be suitable for curb or flat mount. The base shall be constructed of galvanized steel for improved rigidity. Base shall be structurally reinforced to accommodate the blower assembly and burner. Housing construction should be suitable for outdoor or indoor installation.

All doors and at least one side of every sheet metal surface of the unit separating two air-masses of different air temperatures shall be faced with properly secured 1" aluminum-faced insulation for condensation prevention.

The discharge of the unit (down/side/up) shall be internal to the heating module containing the furnaces.

All electrical controls on the control board shall be mounted in an isolated, fully enclosed and insulated vestibule, completely separated from any combustion air, but accessible for servicing needs.

All furnace exhaust flues shall be of double-wall construction. All furnace exhaust flue connections and roof-penetration seams shall be sealed with high-temp fire-barrier 2000+ type silicone caulking.

All unit housings, sizes 1-3, shall be equipped with internal air distribution screens on the upstream side of each furnace heat-exchanger.

All gas valves and electrical safety-limits shall be mounted within the burner vestibule; wiring to these components shall be properly secured and away from all high temperature metal surfaces. The burner

vestibule shall be an integral part of the unit and not extend outside the exterior casing of the unit and not exposed to the main air stream.

If an outdoor unit, high wind rain caps shall be installed at the termination of the furnace discharge flues.

The vestibule full-size door shall provide easy access to controls and gas-train components. Blower door shall provide easy access to blower, motor and drives. Access doors shall be provided on both front and back side of unit providing full access to every part of the unit.

1.03 HOUSING OPTIONAL

- A. The unit shall have double-wall construction consisting of at least two layers of 20 gauge g-90 galvanized steel.
- B. The unit shall have a duct connection(s) with an area equal to or greater than that of the total area of all exhaust flues for the introduction of dedicated combustion air to the burner vestibule.

1.04 BLOWER

Wheels shall be balanced in two planes and done in accordance with AMCA standard 204-96, balance quality and vibration levels for fans. The wheel blades shall be aerodynamically designed to minimize turbulence, increase efficiency and reduce noise. The wheel blades shall be securely attached to the wheel inlet ring. The wheel shall be firmly attached to the fan shaft with set screws and keys. The blower assembly shall be isolated from the fan structure with vibration isolators.

External static: the sum of duct loss plus duct component static- example: louvers, diffusers. All blowers shall be tested and set at rated speed after being installed in the factory-assembled unit.

1.05 BELT DRIVE

- A. Blower(s) shall be forward-curved, centrifugal, class i or ii (depending on requirements of the application), double width, double inlet, constructed g-90 galvanized steel. Unit shall have a heavy-duty, solid-steel shaft.

1.06 DIRECT DRIVE

- A. Direct drive blower assembly shall consist of a centrifugal backward inclined, non-overloading wheel secured directly to a heavy duty, ball bearing type motor via two set screws. The motor and wheel assembly shall be mounted to a heavy gauge galvanized steel frame. The motor shall be controlled by a variable frequency drive, allowing for variable airflow without the need of belts and pulleys.

MOTOR & MOTOR COMPARTMENT

Motors shall be heavy duty ball bearing type and furnished at the specified voltage, phase and enclosure. Motor mounting plate shall be constructed of heavy gauge galvanized steel and shall be designed to provide easy adjustment of belt tension.

1.08 SHAFT & BEARINGS

Shafts shall be precision ground and polished. Heavy duty, pre-lubricated bearings shall be selected for a minimum (150) life in excess of 200,000 hours of operation at maximum cataloged operating speed. They shall be designed for, and individually tested specifically for use in air handling applications.

1.09 BELTS & DRIVES (BELT DRIVE UNITS ONLY)

Belts shall be oil and heat resistant, non-static, grip-notch type. Drives shall be cast type, precision machined and keyed and secured attached to the fan and motor shafts. Fan operating speed shall be factory set using adjustable pitch motor pulleys; motors over 3 hp will come standard with double groove pulleys.

1.10 BURNER & HEAT EXCHANGER

As shown on Drawing.

Burner shall be a tubular in-shot fired design capable of using natural or LP type gas. Each burner ignition shall be of the direct-spark design with remote flame sensing at inlet of the last firing tube of the gas manifold. Each burner ignition module shall be pre-programmed with an ignition sequence comprised of a 1

minute pre-purge, 1 min inter-purge, 2 minute post-purge, 15 second ignition, 3 trials for ignition, and 60 min lockout.

Direct-sparking sequence shall last through the complete during of the trial for ignition period for guaranteed light-off. Burner shall always be lit at maximum gas flow and combustion airflow for guaranteed light-off. Each burner ignition module shall have led indicators for troubleshooting and a set of exposed prongs for testing flame indication signal.

All furnaces shall be controlled by an electronic vernier-type fully modulating control system capable of achieving 80% combustion efficiency over the entire gas firing range of the unit.

Each furnace shall have:

- A. A minimum turndown ratio of 6:1 for natural gas and 5:1 for LP gas.
- B. Each furnace heat exchanger shall be a bent-tube style design made entirely of type 409 stainless steel.
- C. Each furnace shall include a blocked vent safety airflow switch with high temperature silicone tubing operating off of absolute pressure measured inside of the power-vent blower housing.
- D. Each furnace shall include a high temperature auto-recycling limit with a maximum non-adjustable set-point of 200F.
- E. Each furnace shall include a manual reset high temperature flame roll out switch with a non-adjustable set-point of 325F.
- F. Each furnace shall be accessible from both sides of unit.
- G. Each furnace shall include a power-vent assembly for exhausting flue gases with a type PSC type motor that is securely mounted with rubber vibration isolators and easily accessible/removable for service.
- H. Every heat-exchanger shall have a manufacturer-backed 10-year pro-rated warranty.
- I. Every power-vent blower motor and housing shall have a standard 1-year manufacturer-backed warranty.

Each furnace module gas inlet shall be equipped with a 0-35" w.c. gas pressure gauge. A 0-10" w.c. gas pressure gauge shall be installed on the gas manifold of each furnace.

1.11 GAS EQUIPMENT

Standard

All Gas Equipment Shall Conform To Local-Code Requirements

Components:

- A. Modulating-Gas Valve
- B. On/Off Redundant Gas Valve
- C. Burner
- D. Main-Gas Shut-Off Valve
- E. Main-Gas Regulator
- F. Two Solenoid Valves

All gas manifold components shall be piped and wired at the factory.

1.12 OPTIONAL

High gas pressure regulator

1.13 SAFETY CONTROLS

STANDARD

- A. Motor starter with adjustable overloads
- B. Main air-flow safety switch
- C. Electronic flame-safety relay
- D. High-temperature limit switch
- E. Non-fused disconnect

- F. Flame roll-out switch
- G. Main-gas regulator
- H. Two solenoid valves
- I. Modulating-gas valve
- J. Burner
- K. Combustion air-proving switch

1.14 OPTIONAL

- A. High gas-pressure switches to open circuit to electronic flame-safety relay, if gas pressure is too high.
- B. Low gas-pressure switch to open circuit to electronic flame safety relay, if gas pressure is too low.
- C. Adjustable low temperature blower-safety control with bypass timer to shut down unit, if discharge temperature drops below setting.

1.15 ACCESSORIES

- A. Inlet Dampers: Manufacturer shall provide and install on unit, when possible, a two-position, motor-operated damper with internal end switch to energize the blower-starter circuit, when damper is 80% open. Blades shall be a maximum of 6" wide 16 Gauge G-90 galvanized steel shall be made to guarantee the absence of noticeable vibration at design air velocities. Damper blades to be mounted on friction-free synthetic bearings. Damper edges shall have PVC coated polyester fabric mechanically locked into blade edge. Jamb seals to be flexible metal, Compression Type.
- B. Filters: the filters shall be (2") thick, aluminum mesh, coated with super-filter adhesive. Aluminum-mesh filters shall have aluminum frames with media to be layers of slit and expanded aluminum, varying in pattern to obtain maximum depth loading. Washable 2" filters shall be enclosed in two-piece, die-cut frame with diagonal supports. Frame shall be constructed of heavy-duty beverage board. Filter media is supported on the air leaving side by a metal grid.
 - 1. Filter section: shall be (insulated) (uninsulated) constructed of g-90 galvanized steel with filters supported by internal slides and with removable access panels. Filters shall be provided in a v-bank arrangement.
- C. Fresh-Air Inlet Hood: Shall Be Constructed Of G-90 Galvanized Steel With Bird screen.
- D. Fresh-Air Inlet Hood/Filter Combination: Shall Be Constructed Of G-90 Galvanized Steel With Bird screen And (2") Cleanable Filters Supported By Internal Slides Mounted In The Inlet Face Of The Hood.
- E. Discharge diffusers: shall be constructed of g-90 galvanized steel with horizontal and vertical blades capable of four-way diffusion.
- F. Curb: 20" curb shall be constructed of 20 ga or greater g-90 galvanized steel as a completed welded assembly.
- G. Cooling Coil Section: Cooling Coil Section Shall Be Bolted Directly To Intake Of The Blower Section. Coil Section To Be Designed To Fit Onto Common Curb With Main Unit. Base Of Coil Section To Be Constructed Same As Main Unit With Double Pitch Stainless Steel Drain Pan For Coil. Casing And Roof To Be 20 Ga. G-90 Galvanized Construction. Inside Of Section To Be Fully Insulated With Foil Back Insulation. Dx Or Chilled Water Coil To Meet Scheduled Requirements.

1.16 TEMPERATURE CONTROL SYSTEMS

HMI control: one HMI or human-machine interface to be provided standard. Space HMI or room sensor shall be provided for temperature control utilizing space temperature. Additional HMIs or room sensors can be provided for space averaging. Cat5 connections shall be utilized between all HMIs. All settings and set points shall be able to be controlled at any HMI.

Activate based on: shall have the ability to activate heating/cooling based on the following.

- A. Intake temperature only
- B. Space temperature only
- C. Intake and space temperature

D. Intake or space temperature

TEMPERING MODE: SHALL HAVE THE ABILITY TO CONTROL HEATING/COOLING BASED ON THE FOLLOWING.

- A. Discharge – unit shall modulate to maintain discharge temperature.
- B. Space – unit shall modulate to maintain space temperature.
- C. Bas – unit shall be controlled via call for fan, call for heat, call for cool (optional), as well as a modulating heat input (0-20ma, 4-20ma, 0-10v, or 2-10v).
- D. (optional) DDC – unit shall be controlled via a DDC controller. Protocols to include BACnet or Lonworks.

BLOWER MODE:

- A. Manual (on) – blower shall run constantly regardless of heating/cooling based on blower on/off button on HMI.
- B. Auto – blower shall only run on a call for heating or cooling.
- C. Interlock (off) – blower shall only run when unit interlock is energized.

SCHEDULING (OPTIONAL): SHALL HAVE THE ABILITY FOR 7 DAY SCHEDULING.

- A. Shall have the ability to schedule 2 occupied periods per day.
- B. Separate temperature set points for occupied and unoccupied periods.
- C. Separate blower modes for occupied and unoccupied periods.
- D. Occupied override.

SERVICE FUNCTIONALITY:

- A. Ability to monitor temperatures and VFD feedback real-time throughout unit.
- B. Test fan, heat (high/low fire setting) and cooling.
- C. Fault history storing past twenty faults.
- D. VFD parameter adjustment through HMI.

1.17 RE-CIRCULATING CONTROL OPTIONS

Manual/0-10v control: the dampers can be manually controlled from the HMI in the unit or from a remote HMI to any position from 0% to 100% fresh air to match building ventilation requirements.

Field wired control (two position): the dampers can be controlled by a two position switch (field supplied switch device) to open the fresh air to 100%.

Outdoor air percentage: the dampers can be controlled from the HMI in the unit or from a remote HMI to any position from 0% to 100%. The IBT board utilizes an algorithm to alter its 0-10v output to the mixing box damper to maintain an exact outdoor air percentage based on entering and leaving temperatures.

Static pressure control (photohelic): the dampers can be controlled by a building static pressure control. This controller will sense the difference between pressure inside the building and pressure outside the building, and position the dampers to maintain the pressure setting on the controller.

Building automation system (bas) control: the supply and return dampers will modulate based on a 0-10 vdc signal from a building automation system.

Schedule control: the supply and return damper will change based on the schedule; the unit will maintain the appropriate outdoor air percentage based on the schedule state.

1.18 VAV OPTIONS

VAV (static pressure control): a factory-supplied field wired VFD is provided which varies the speed of the blower wheel. The VFD is controlled by a field wired static pressure controller which measures building

pressure and uses auxiliary inputs on the IBT control board to accelerate or decelerate the blower speed to maintain the building pressure set on the static pressure controller.

VAV (manual): a factory-supplied field wired VFD is provided which varies the speed of the blower wheel. The VFD is controlled by a preset speed on the IBT control board.

VAV (preset speeds): a factory-supplied field wired VFD is provided which varies the speed of the blower wheel. The VFD is controlled using auxiliary pins on the IBT control board to switch between preset speeds.

VAV (0-10vdc): a factory-supplied field wired VFD is provided which varies the speed of the blower wheel. The VFD is controlled using external 0-10vdc signal to vary blower speed.

wiring and electrical
standard

The control circuit voltage shall be 24 volts.

A control transformer shall be provided.

Unit shall have standing 120 vac power.

The control wiring shall be carried in wire channel or conduit.

Wiring in control enclosures shall be in accordance with the national electrical code and the local code, as it may affect the installation.

Motor starter shall be provided.

Starter shall be line voltage, definite purpose type.

Unit(s) shall be complete with all items such as relays, starters, switches, safety controls, conduit and wire as previously mentioned, and as required for proper operation.

All factory-mounted controls shall be factory prewired to the unit control panel.

1.19 OPTIONAL

- A. Single point electrical connection shall be supplied.
- B. Blower-on delay timer to pre-heat the heat-exchanger prior to energizing the main blower.
- C. Convenience outlet shall be provided on the control board with 120 vac service.
- D. Freeze-stat shall be provided with adjustable temperature set point to shut down the main blower in case of burner failure.
- E. Fire stat with adjustable set-p temperature.
- F. Dirty filter airflow switch with led indicator light on remote panel.
- G. Cabinet heater strip with thermostat.
- H. Variable frequency drive for main blower motor.

1.20 FACTORY TESTED

Unit(s) shall be operated, tested, and set at the factory using job-site conditions for electrical and gas input. All operating and safety controls shall be tested and set at the factory. Adjustable, or fixed sheaves shall be set for proper rpm at specified conditions. Gas-pressure regulator shall be set for specified burning rate at specified inlet pressure.

1.21 SERVICE AND PARTS

The supplier shall furnish gas piping schematics, as built wiring connection and control-circuit diagrams, dimension sheets and a full description of the unit(s). Service manuals, showing service and maintenance requirements, shall be provided with each unit.

END OF SECTION

SECTION 23 6423
SCROLL WATER CHILLERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Air-cooled scroll water chillers.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 -Cast-in-Place Concrete: Concrete housekeeping pads.
- B. Section 23 2113 -Hydronic Piping.
- C. Section 23 2114 -Hydronic Specialties.
- D. Section 26 0583 -Wiring Connections.

1.03 REFERENCE STANDARDS

- A. AHRI 550/590 (I-P) -Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle; 2015.
- B. ASHRAE Std 15 -Safety Standard for Refrigeration Systems; 2013.
- C. ASHRAE Std 90.1 I-P -Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. ASME BPVC-VIII-1 -Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2017.
- E. NEMA 250 -Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- F. UL 1995 -Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 -Administrative Requirements for submittal procedures.
- B. Product Data: Provide rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.
- C. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate equipment, piping and connections, valves, strainers, and thermostatic valves required for complete system.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Daikin Applied Americas, Inc; model AGZ....: www.daikinapplied.com/#sle.
- B. Trane Technologies, PLC; model CGAM: www.trane.com/#sle.
- C. York, a brand of Johnson Controls International, PLC: www.york.com/#sle.
- D. or approved equal.
- E. Substitutions: See Section 01 6000 - Product Requirements.
 - 1. The chilled water system has been designed based on specific capacities and characteristics of equipment specified in this section and other sections.

2.02 AIR-COOLED SCROLL WATER CHILLERS

- A. Chillers: Factory assemble and test chiller consisting of compressor(s), compressor motor(s), evaporator, condenser, enclosure, refrigeration circuits(s) and specialties, interconnecting piping, starters, and microprocessor-based controls.
1. Rating: AHRI 550/590 (I-P).
 2. Safety: UL 1995 and ASHRAE Std 15.
 3. Construction & Testing: ASME BPVC-VIII-1 as applicable for construction type.
 4. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the Authority Having Jurisdiction as suitable for the purpose specified and indicated.
 5. Energy Efficiency: ASHRAE Std 90.1 I-P.
 6. Enclosures:
 - a. Frame: 1) Heavy-gauge steel. 2) Factory apply hot-dipped galvanized or air-dried paint finish.
 - b. Steel Chiller Cabinets: 1) Factory apply baked-on enamel or baked-on powder paint finish.
 - c. Electrical Equipment: NEMA 250 or UL 1995 as applicable.

2.03 COMPRESSORS AND EVAPORATOR

- A. Compressors: Hermetic scroll type.
1. Unit: Fully hermetic type with multiple, direct-drive compressors with discharge and suction service valves.
 2. Vibration Control: Factory installed internal isolators or field installed external isolators.
 3. Oil Lubrication System: Initial oil charge, oil sump, heater, oil level, and sight glass.
 4. Capacity Reduction System: Compressor staging with control down to 12 percent of full load without the activation of hot gas by-pass.
 5. Motor: 3,600 or 3,500 rpm, suction gas-cooled, with thermal or current overload protection.
- B. Evaporator: Provide shell and tube or brazed plate type.
1. Shell and Tube Type:
 - a. Shell, removable heads, and tube support sheets constructed of carbon steel.
 - b. Tubes: Mechanically expand and fasten, seamless, externally or internally enhanced, copper tubes into intermediate tube support sheets along the length of shell to avoid contact and relative motion between tubes.
 - c. Refrigerant Working-Side Pressure Rating: 400 psig (2758 kPa) minimum.
 - d. Water Working-Side Pressure Rating: 150 psig (1034 kPa) minimum.
 - e. Provide with flanged or grooved connections.
 - f. Insulation for all cold surfaces. 1) Insulation is factory or field installed on shell, connections, and suction piping. 2) 0.75 inches (20 mm) minimum thickness, closed cell, expanded polyvinyl chloride, polyurethane, or vinyl nitrate polymer insulation with a maximum k value of 0.28.
 - g. Provide factory or field installed vents and water drain connections on evaporator or piping.
 - h. Provide factory or field installed fittings for temperature control sensors on evaporator or piping.
 - i. Freeze Protection for Outdoor Locations: Provide thermostatically controlled electric heater to protect from freezing at ambient temperatures down to minus 20 degrees F (minus 28.9 degrees C).
 2. Brazed Plate Type:
 - a. Plate Material: 316 stainless steel.
 - b. Refrigerant Working-Side Pressure Rating: 430 psig (2965 kPa) minimum.
 - c. Water Working-Side Pressure Rating: 150 psig (1034 kPa) minimum.
 - d. Provide with flanged or grooved connections.
 - e. Insulation for all cold surfaces. 1) Insulation is factory or field installed on evaporator, connections, and suction piping. 2) 0.75 inches (20 mm) minimum thickness, closed cell, expanded polyvinyl chloride, polyurethane, or Armaflex II insulation with a maximum k value of 0.28. Provide factory or field installed vents and water drain connections on evaporator or piping.
 - g. Provide factory or field installed fitting for temperature control sensors on evaporator or piping.
 - h. Freeze Protection for Outdoor Locations: Provide thermostatically controlled electric heater to protect from freezing at ambient temperatures down to minus 20 degrees F (minus 28.9 degrees C).

2.04 REFRIGERATION CIRCUITS

- A. Provide multiple independent refrigeration circuit(s) with one or multiple compressor(s) per circuit.
- B. Provide liquid line shut-off valve, filter-drier, expansion valve, and refrigerant relief device for each independent circuit.

2.05 INTEGRATED MICROPROCESSOR BASED DDC CONTROLS PACKAGE

- A. Pre-wire, assemble, factory mount, and test operating and safety control system consisting of a digital display or gauges, on-auto-off switch, motor starters, disconnect switches, power and control wiring. Provide controls, monitoring, programmable set-points, alarms, and BAS as defined below:
 - 1. Automatic Adjustable Operating Controls:
 - a. Temperature of chilled water leaving chiller.
 - b. Chiller system capacity control based on set-points and system load.
 - c. Compressor short-cycling prevention.
 - d. Lead/lag for multiple compressors.
 - e. Automatic reset on power source failure.
 - f. Load limiting.
 - 2. Normal Operation Monitoring and Open Cover-less Displays:
 - a. Hours of operation.
 - b. Suction and discharge refrigerant pressures.
 - c. Automatic diagnostics.
 - d. Number of starts.
 - e. On/off compressor status.
 - f. Entering and leaving chilled water temperatures.
 - g. Status of operation.
 - h. Weekly purge cycle totalization if applicable.
 - i. Oil pressure.
 - 3. Set-Points:
 - a. Leaving chilled water temperature.
 - b. Date/time.
 - 4. Automatic Chiller Shut-Down Safety Controls and Alarm:
 - a. Automatic Reset: 1) Chilled water flow interlock. 2) Voltage protection (over/under). 3) Phase reversal protection.
 - b. Manual Reset: 1) Evaporator low pressure. 2) High motor winding temperature. 3) Low chilled water temperature. 4) Low chilled water flow. 5) High condenser refrigerant discharge pressure. 6) Motor current overload and phase loss. 7) Low oil flow.
 - c. Remote Alarm: Activate remote, audible bell upon safety shutdown of chiller.
 - 5. Building Automation System (BAS) Communications via Shielded Cable:
 - a. Minimum Data Transmission to BAS: 1) All system operating conditions. 2) Capacity control information. 3) Safety shutdown conditions.
 - b. Minimum Operating Commands from BAS: 1) Remote unit start/stop. 2) Remote chilled water reset.
- B. System must be able to connect to the Johnson Controls Metasys system. Controls can be removed from existing chiller and installed in new chiller at discretion of contractor or provide new controls. As part of contract, include cost of all programming required to make system operational in unit and at hind end computer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Align chiller package on steel or concrete foundations.
- C. Install units on vibration isolators.
- D. Connect to electrical service.
- E. Connect to chilled water piping.
- F. Arrange piping for easy dismantling to permit tube cleaning and removal.

3.02 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 -Closeout Submittals for additional submittals.
- B. See Section 01 7900 -Demonstration and Training for additional requirements.
- C. Demonstrate proper operation of equipment to Owner's designated representative.

3.03 MAINTENANCE

- A. Provide a separate maintenance contract for specified maintenance service.

3.04 WARRANTY

- A. Provide a 5-year manufacturer's warranty for all equipment.
- B. Provide a 2-year contractor warranty for all labor for the chiller.

END OF SECTION

SECTION 23 7313

MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Casing construction.
- B. Fan section.
- C. Coil section.
- D. Filter and air cleaner section.
- E. Damper section.
- F. Controls.

1.02 RELATED REQUIREMENTS

- A. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

1.03 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.
- B. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- C. AMCA 99 - Standards Handbook; 2010.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2007.
- E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.
- G. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2012.
- H. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012.
- I. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2012, with 2015 amendments.
- J. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Amendments and Errata.
- K. ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating; 2011.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- N. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Rev. 2009).
- O. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- P. UL 508 - Industrial Control Equipment; Underwriters Laboratories Inc; Current Edition, Including All Revisions.
- Q. UL 795 - Commercial-Industrial Gas Heating Equipment; Current Edition, Including All Revisions.
- R. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Published Literature: Indicate dimensions, weights, capacities, ratings, gages and finishes of materials, and electrical characteristics and connection requirements.
 - 2. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
 - 3. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.

- 4. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
- C. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.
- D. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- E. Manufacturer's Instructions: Include installation instructions.
- F. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Fan Belts: One set for each unit.
 - 3. Extra Filters: One set for each unit.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.
- B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.
- C. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CASING CONSTRUCTION

- A. Full Perimeter Base Rail:
 - 1. Construct of galvanized steel.
 - 2. Provide base rail of sufficient height to raise unit for external trapping of condensate drain pans.
- B. Casing:
 - 1. Construct of one piece, insulated, double wall panels.
 - 2. Provide mid-span, no through metal, internal thermal break.
 - 3. Construct outer panels of galvanized steel and inner panels of galvanized steel.
 - 4. Casing Air Pressure Performance Requirements:
 - a. Able to withstand up to 8 inches w.g. (2 kPa) positive or negative static pressure.
 - b. Not to exceed 0.0042 inches per inch (0.0042 mm/mm) deflection at 1.5 times design static pressure up to a maximum of plus 8 inches w.g. (2 kPa) in positive pressure sections and minus 8 inches w.g. (2 kPa) in negative pressure sections.
- C. Access Doors:
 - 1. Construction, thermal and air pressure performance same as casing.
 - 2. Provide surface mounted handles on hinged, swing doors.

- D. Unit Flooring: Construct with sufficient strength to support expected people and equipment loads associated with maintenance activities.
- E. Casing Leakage: Seal joints and provide airtight access doors so that air leakage does not exceed one percent of design flow at the specified casing pressure.
- F. Insulation:
 - 1. Provide minimum thermal thickness of 12 R (2.29 RSI) throughout.
 - 2. Completely fill panel cavities in each direction to prevent voids and settling.
 - 3. Comply with NFPA 90A.
- G. Louvers: Stationary, of galvanized steel, 4 inch (100 mm) deep with plenum, nylon bearings, 1/2 inch (13 mm) mesh, 0.04 inch (1.0 mm) galvanized wire bird screen in aluminum frame, and bearing AMCA Certified Ratings Seal in accordance with AMCA 500-L. Furnish adjustable louvers with hollow vinyl bulb edging on blades and foam side stops to limit leakage to maximum 2 percent at 4 inch wg (1 kPa) differential pressure when sized for 2000 fpm (10 m/s) face velocity.
- H. Finish:
 - 1. Indoor Units:
 - a. Provide exterior, galvanized steel panels with painted surface complying with ASTM B177/B177M.
 - b. Color: Manufacturer's standard color.

2.03 FAN SECTION

- A. Type: Forward curved, single width, single inlet, centrifugal plug type fan, conforming to AMCA 99.
- B. Performance Ratings: Determined in accordance with AMCA 210 and labeled with AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301; tested to AMCA 300 and label with AMCA Certified Sound Rating Seal.
- D. Bearings: Self-aligning, grease lubricated, with lubrication fittings extended to exterior of casing with plastic tube and grease fitting rigidly attached to casing.
- E. Mounting:
 - 1. Locate fan and motor internally on welded steel base coated with corrosion resistant paint.
 - 2. Factory mount motor on slide rails.
 - 3. Provide access to motor, drive, and bearings through removable casing panels or hinged access doors.
 - 4. Mount base on vibration isolators.
- F. External Motor Junction Box: Factory mount NEMA 4 external junction box and connect to extended motor leads from internally mounted motors.
- G. Motor Wiring Conduit: Factory wire fan motor wiring to the unit mounted variable frequency drive.
- H. Fan Accessories:
- I. Flexible Duct Connections:
 - 1. For separating fan, coil, and adjacent sections.
- J. Drives:
 - 1. Conform to AMCA 99.
 - 2. Bearings: Heavy duty pillow block type, ball bearings, with ABMA STD 9, L-10 life at 50,000 hours.
 - 3. Shafts: Solid, hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.
 - 4. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts, and keyed. Variable and adjustable pitch sheaves for motors 15 hp and under selected so required rpm is obtained with sheaves set at mid-position; fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.
 - 5. Belt Guard: Fabricate to SMACNA (DCS); 0.106 inch (2.6 mm) thick, 3/4 inch (20 mm) diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan

supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.04 COIL SECTION

- A. Casing: Provide access to both sides of coils. Enclose coils with headers and return bends exposed outside casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.
- B. Drain Pans: 24 inch (600 mm) downstream of coil and down spouts for cooling coil banks more than one coil high.
- C. Eliminators: Three break of galvanized steel, mounted over drain pan.
- D. Hot Water Heating Coil: Refer to drawings for specifications.

2.05 FILTER AND AIR CLEANER SECTION

- A. General: Provide filter sections with filter racks, minimum of one access door for filter removal, and filter block-offs to prevent air bypass.
- B. Pleated Media Filters:
 - 1. Media: 2 inch (50 mm), 100 percent synthetic fibers, continuously laminated to a grid with water repellent adhesive, and capable of operating up to a maximum of 625 fpm (3.17 m/s) without loss of efficiency and holding capacity.
 - 2. Frame: Steel wire grid.
 - 3. Minimum Efficiency Reporting Value: 5 MERV when tested in accordance with ASHRAE Std 52.2.
- C. Differential Pressure Gage:
 - 1. Provide factory installed dial type differential pressure gage, flush mounted with casing outer wall, and fully piped to both sides of each filter to indicate status.
 - 2. Maintain plus/minus 5 percent accuracy within operating limits of 20 degrees F (minus 6.7 degrees C) to 120 degrees F (48.9 degrees C).

2.06 DAMPER SECTION

- A. Mixing Section: Provide a functional section to support the damper assembly for modulating the volume of outdoor, return, and exhaust air.
- B. Damper Blades:
 - 1. Double-skin airfoil design with metal, compressible jamb seals and extruded-vinyl blade-edge seals on each blade.
 - 2. Self-lubricating stainless steel or synthetic sleeve bearings.
 - 3. Comply with ASHRAE Std 90.1 I-P for rated maximum leakage rate.
 - 4. Provide leakage testing and pressure ratings in compliance with AMCA 500-D test methods.
 - 5. Arrange in parallel or opposed-blade configuration.
- C. Barometric Relief Dampers:
 - 1. Frame: Roll formed galvanized steel.
 - 2. Blades: Roll formed galvanized steel.
 - 3. Blade Seals: Extruded vinyl, mechanically attached to the blade edge.
 - 4. Material:

2.07 CONTROLS

- A. Combination VFD - Disconnects:
 - 1. Provide factory mounted, combination VFD - disconnect for each fan motor.
 - 2. Mount VFD-disconnect on fan section externally in a NEMA 1 enclosure within a dedicated controls section or housed fan section.
 - a. Internal Enclosure Construction Characteristics:
 - 1) Integral part of unit casing to allow for thermal venting to casing interior.
 - 2) Accessible from unit exterior via access door.
 - 3) Construction of access doors same throughout unit.

- B. Factory Installed Direct Digital Control (DDC) System:
 - 1. Control Options:
 - a. Electronic End Devices:
 - 1) Accommodate integration into existing building systems.
 - b. Mixing Section Spring Return Damper Actuators:
 - 1) Outdoor Air Damper: Normally closed.
 - 2) Return Air Damper: Normally open.
 - c. Air Flow Measurement Stations: 2 to 10 VDC signal corresponding to CFM for controlling and documenting airflow.
 - d. Fan Discharge Temperature and Temperature Averaging Sensors: Suitable for integration into the BAS system.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Bolt sections together with gaskets.
- C. Install flexible duct connections between fan inlet and discharge ductwork and air handling unit sections. Ensure that metal bands of connectors are parallel with minimum one inch (25 mm) flex between ductwork and fan while running.
- D. Install assembled unit on vibration isolators. Install isolated fans with resilient mountings and flexible electrical leads. Install restraining snubbers as indicated. Refer to Section 22 0548. Adjust snubbers to prevent tension in flexible connectors when fan is operating.
- E. Provide fixed sheaves required for final air balance.
- F. Make connections to coils with unions or flanges.
- G. Hydronic Coils:
 - 1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
 - 2. Provide shut-off valve on supply line and lockshield balancing valve with memory stop on return line.
 - 3. Locate water supply at bottom of supply header and return water connection at top.
 - 4. Provide manual air vents at high points complete with stop valve.
 - 5. Ensure water coils are drainable and provide drain connection at low points.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Coordination of Other Tests and Inspections:
 - 1. Refer to Section 23 0593.

3.03 SYSTEM STARTUP

- A. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.
- B. Adjust for proper operation within manufacturer's published tolerances.

3.04 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. See Section 01 7900 - Demonstration and Training, for additional requirements.
- C. Demonstrate proper operation of equipment to Owner's designated representative.

END OF SECTION

SECTION 23 7413

PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged roof top unit.
- B. Unit controls.
- C. Maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 23 0548 - Vibration and Seismic Controls for HVAC.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.
- B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp: www.carrier.com/#sle.
- B. Trane, a brand of Ingersoll Rand: www.trane.com/#sle.
- C. York International Corporation/Johnson Controls Inc: www.johnsoncontrols.com/#sle.
- D. or approved equal.

2.02 MANUFACTURED UNITS

- A. General: Roof mounted units having gas burner and electric refrigeration.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

2.03 FABRICATION

- A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners. Structural members shall be minimum 18 gauge, 0.0478 inch (1.21 mm), with access doors or panels of minimum 20 gauge, 0.0359 inch (0.91 mm).
- B. Insulation: 1/2 inch (13 mm) thick neoprene coated glass fiber with edges protected from erosion.
- C. Heat Exchangers: Aluminized steel, of welded construction.

- D. Supply and Return Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted high efficiency motor or direct drive as indicated. Isolate complete fan assembly. See Section 23 0548.
- E. Air Filters:
 - 1. Merv 13

2.04 BURNER

- A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.
- B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.

2.05 EVAPORATOR COIL

- A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
- B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons (26 kw) cooling capacity and larger.

2.06 COMPRESSOR

- A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

2.07 CONDENSER COIL

- A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.
- B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

2.08 MIXED AIR CASING

- A. Dampers: Provide remote controlled outside and return air dampers with damper operator and remote rheostat for adjusting outside air quantity.

2.09 OPERATING CONTROLS

- A. Provide low voltage, adjustable room thermostat to control burner operation, compressor and condenser fan, and supply fan to maintain temperature setting.
 - 1. Include system selector switch (heat-off-cool) and fan control switch (auto-on).

2.10 OPERATING CONTROLS - VARIABLE VOLUME UNITS

- A. Temperature transmitter located in supply air shall signal electronic logic panel to control mixing dampers and cooling in sequence. Mixing section shall operate as first stage of cooling and revert to minimum outside air above approximately 75 degrees F (24 degrees C) as determined by enthalpy of return and outdoor air.
- B. Control cooling by cycling compressors, cylinder unloading, and hot gas bypass.

2.11 HEAT RECOVERY COIL

- A. Provide copper tube aluminum fin coil assembly with multiple circuits arranged to provide heat recovery.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install in accordance with NFPA 90A.

3.03 SYSTEM STARTUP

- A. Prepare and start equipment. Adjust for proper operation.

3.04 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

3.05 MAINTENANCE

- A. Provide service and maintenance of packaged roof top units for one year year from Date of Substantial Completion.
- B. Provide routine maintenance service with a two month interval as maximum time period between calls.
- C. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.
- D. After each service call, submit copy of service call work order or report that includes description of work performed.

END OF SECTION

SECTION 23 7433
DEDICATED OUTDOOR AIR UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Direct fired make-up air heater.
- B. Cooling coil section and compressor-condenser unit.
- C. Service platform.
- D. Controls.

1.02 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.
- B. ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.
- C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- F. UL (DIR) - Online Certifications Directory; Current Edition.
- G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Greenheck: www.greenheck.com/#sle.
- B. I.C.E. (Industrial Commercial Equipment Manufacturing Ltd.): www.ice-ww.com/#sle.
- C. Applied Air/Mestek Technology, Inc: www.appliedair.com/#sle.
- D. Trane.
- E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

- A. Comply with NFPA 70.
- B. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

2.03 MANUFACTURED UNITS

- A. Unit: Outdoor dual volume unit with refrigeration package.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207. Testing: ASHRAE Std 23.1.
 - 2. Performance Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1 I-P.

2.04 FABRICATION

- A. Casing and Components: Steel panels, 18 gauge, 0.0478 (1.21 mm) reinforced with structural angles and channels to ensure rigidity; access panels to burner and blower motor assemblies from either side of unit.

2.05 FILTERS

- A. Filter: Removable 2 inches (50 mm) thick high velocity permanent filters in metal frames.

2.06 FAN

- A. Fan: Statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy duty self-aligning pre-lubricated ball bearings and V-belt drive with matching motor sheaves and belts.

2.07 CONTROLS

- A. Controls: Pre-wire unit for connection of power supply. Field wiring from unit to remote control panel makes unit operative.
- B. Remote Control Panel: On-off-auto switch, summer-winter switch, heat-off-cool switch, indicating lights for supply fan, exhaust fan, pilot operation, burner operation, lockout indication, and clogged filter indication.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install to NFPA 90A.

END OF SECTION

SECTION 23 8113
PACKAGED TERMINAL AIR-CONDITIONERS

PART 1 GENERAL

2.01 SECTION INCLUDES

- A. Air conditioning units.
- B. Cabinet.
- C. Evaporator fan.
- D. Compressor.
- E. Evaporator coil.
- F. Condenser.
- G. Heating coil.
- H. Air filters.
- I. Controls.

2.02 RELATED REQUIREMENTS

- A. Section 23 2300 - Refrigerant Piping.
- B. Section 23 6313 - Air Cooled Refrigerant Condensers.

2.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for manufactured products and assemblies. Indicate water, drain, thermostatic valves, and electrical rough-in connections with electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Daikin Industries Co, Ltd: www.daikin.com/#sle.
- B. Friedrich Air Conditioning Co: www.friedrich.com/#sle.
- C. Trane Inc: www.trane.com/#sle.
- D. Amana.
- E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 AIR CONDITIONING UNITS

- A. Description: Packaged, self-contained, factory assembled, prewired unit, consisting of cabinet, compressor, condensing coil, evaporator fan, evaporator coil, discharge plenum, outside air connection, heating coil, air filters, and controls; fully charged with refrigerant and filled with oil.
- B. Assembly: Up flow air delivery, in draw-through configuration as indicated.
- C. Energy Efficiency:
 - 1. Cooling Capacity: Greater than or equal to 7000 Btu/h (2052 W) and less than or equal to 15000 Btu/h (4396 kW):
 - a. Energy Efficiency Ratio: 10.0, minimum.
 - b. Coefficient of Performance: 3.6, minimum.

2.03 CABINET

- A. Frame and Panels: Galvanized steel with baked enamel finish, easily removed access doors or panels with quick fasteners.
- B. Insulation: Minimum 1/2 inch (13 mm) thick acoustic duct liner for lining cabinet interior.
- C. Drain Pan: Galvanized steel with corrosion-resistant coating.

2.04 EVAPORATOR FAN

- A. Fan: V-Belt driven, with permanently lubricated bearings, double width, double inlet, forward curved centrifugal fan, statically and dynamically balanced, resiliently mounted.
- B. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

2.05 COMPRESSOR

- A. Hermetically sealed, 3600 rpm maximum, resiliently mounted with positive lubrication and internal motor protection.

2.06 EVAPORATOR COIL

- A. Direct expansion coiling coil of seamless copper or aluminum tubes expanded into aluminum fins.
- B. Refrigeration circuit with externally equalized thermal expansion valve, filter-drier, and charging valves.

2.07 CONDENSER

- A. Co-Axial: Copper tube in copper tube or shell and tube with finned copper tubes in steel shell with water temperature actuated water regulating valve.
- B. Fan: Double width, double inlet, forward curved centrifugal fan, statically and dynamically balanced, with permanently lubricated bearings.
- C. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

2.08 HEATING COIL

- A. Helical nickel-chrome resistance wire coil heating elements with refractory ceramic support bushings, with automatic reset thermal cut-out, built-in magnetic contactors, manual reset thermal cut-out, airflow proving device, load fuses.

2.09 AIR FILTERS

- A. Easily removed 2 inch (50 mm) thick disposable glass fiber panel filters.

2.10 CONTROLS

- A. Factory wired controls shall include contactor, high and low pressure cutouts, internal winding thermostat for compressor, control circuit transformer, non-cycling reset relay.
- B. Provide thermostat to cycle cooling, mounted within unit with 'fan-off-cool' switch allowing continuous fan operation, or cycling fan on call for cooling.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide shut-off valves in condenser water inlet and outlet piping.
- C. Pipe condensate from drain pan to nearest floor drain.

END OF SECTION

SECTION 26 0500
COMMON WORK RESULTS – ELECTRICAL

PART 1 - GENERAL

1.1 EXECUTION OF THE WORK

- A. These specifications call out certain duties of the Electrical Contractor and his Subcontractors. They are not intended as a material list of items required by the Contract. Any reference in these specifications and on the accompanying drawings to the Contractor, Electrical Contractor, Electrical Subcontractor or abbreviation "E.C.", shall be construed to mean the Contractor responsible for all electrical construction (Division 26) work for this project.
- B. This division of the specifications covers the electrical systems of the project. It includes work performed by the electrical trades as well as trades not normally considered as electrical trades.
- C. Provide all items and work indicated on the Drawings and all items and work called for in this division of the specifications in accordance with the conditions of Contract (Division 01 General Requirements Documents). This includes all incidentals, equipment, appliances services, hoisting, scaffolding, supports, tools supervision, labor consumable items, fees licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to provide fully operable systems.
- D. Comply with all provisions of the Contract Documents including the General Conditions, and Division 01 General Requirements of the specifications.
- E. Certain terms such as "shall, provide, install, complete, start-up" are not used in some parts of these specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.
- F. Examine and compare the Electrical Drawings with these specifications, and report any discrepancies between them to the Architect/Engineer and obtain from him written instructions for changes necessary in the work. At time of bid the most stringent requirements must be included in said bid.
- G. Examine and compare the Electrical Drawings and Specifications with the Drawings and Specifications of other trades, and report any discrepancies between them to the Architect/Engineer and obtain from him written instructions for changes necessary in the work. At time of bid, the most stringent requirements must be included in said bid.
- H. Install and coordinate the electrical work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interferences in a manner approved by the Architect/Engineer. All changes required in the work of the Contractor, caused by his neglect to do so, shall be made by him at his own expense.
- H. It is the intent of the Drawings and Specifications to provide a complete workable system ready for the Owner's operation. Any item not specifically shown on the Drawings or called for in the Specifications, but normally required to conform to the intent, are to be considered a part of the Contract.
- J. These specifications are basically equipment, installation, and performance Specifications. Some installation details are indicated on the Drawings. Where these differ from the Specifications, apply the more stringent at time of bid. Upon award of bid, contact Architect/Engineer for definite instructions.
- K. All materials furnished by the Contractor shall be new and unused (temporary lighting and power products are excluded) and free from defects. All materials used shall bear the Underwriter's Laboratory, Inc. label provided a standard has been established for the material in question.

- L. All products and materials shall be new, clean, free of defects and free of damage and corrosion.
- M. The exclusion from, or limitation in, the symbolism used on the Drawings or the language used in the Specifications for electrical work shall not be interpreted as a reason for omitting the accessories necessary to complete any required system or item of equipment.
- N. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.
- O. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material shall be the product of one manufacturer throughout. Multiple manufacturers will not be permitted.
- P. Receive, inspect, store, install and wire Owner-furnished equipment where Owner furnished equipment is supplied.
- Q. Painting
 - 1. All manufactured electrical equipment such as switchgear, panelboards, control equipment, lighting fixtures, etc., shall have factory-applied finish as specified in the appropriate article in the Electrical Parts of the Specification.
 - 2. All other uncoated steel items such as boxes supports, hanger, rods, etc., shall be galvanized or have a shop coat of paint applied under this Part of the Specification. Normally shop coats shall be an approved primer containing at least 50 percent rust inhibitive pigment, applied before assembling the different parts.
 - 3. Including painting and retouching of:
 - a. Pre-finished enclosures of panelboards, switches, wireways, etc., where the finish has been slightly damaged in transit before assembling the different parts.
 - b. Any woodwork furnished in the electrical work.
 - c. Fixture hangers, except those received from manufacturers that are prefinished.
 - d. Miscellaneous iron brackets and supports.
 - e. Steel conduits buried in earth.
 - 4. Woodwork installed under this part of the specification shall be finished with filler sealer plus two (2) coats of PPG "Water Spar" gloss varnish.

1.2 COORDINATION OF THE WORK

- A. Certain materials will be provided by other trades. Examine the Contract Documents to ascertain these requirements.
- B. Carefully check space requirements with other trades and the physical confines of the area to ensure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. No items foreign to the electrical system shall be run in the dedicated space of the electrical equipment. Dedicated space shall be defined as the width and depth of the equipment from the floor to the bottom of the structural ceiling. Foreign systems include but are not limited to ductwork, piping, sprinklers, drip trays, etc. Contractor shall be responsible to coordinate the locations of the dedicated spaces with all trades as required.

- D. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
 - E. Wherever work interconnects with work of other trades, coordinate with other trades to ensure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
 - F. Due to the type of installation, a fixed sequence of operation is required to properly install the complete systems. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
 - G. The locations of lighting fixtures, outlets, panels and other equipment indicated on the Drawings are approximately correct, but they are understood to be subject to such revision as may be found necessary or desirable at the time the work is installed in consequence of increase or reduction of the number of outlets, or in order to meet field conditions or to coordinate with modular requirements of ceilings, or to simplify the work, or for other legitimate causes.
 - H. Exercise particular caution with reference to the location of panels, outlets, switches, etc., and have precise and definite locations approved by the Architect/Engineer before proceeding with the installation.
 - I. The Drawings show only the general run of raceways and approximate location of outlets. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.
 - J. Obtain from the Architect/Engineer in the field, the location of such outlets or equipment not definitively located on the Drawings.
 - K. Circuit "tags" in the form of arrows are used where shown to indicate the home runs of raceways to electrical distribution points. These tags show the circuits in each home run and the panel designation. Show the actual circuits numbers on the finished record tracing and on panel directory card. Where circuiting is not indicated, Electrical Contractor must provide required circuiting in accordance with the loading indicated on the drawings and/or as directed.
 - L. The Drawings generally do not indicate the exact number wires in each conduit for the branch circuit wiring of fixtures, and outlets, or the actual circuiting. Provide the correct wire size and quantity as required by the indicated circuiting and/or circuit numbers indicated and control, wiring diagrams, if any, specified voltage drop or maximum distance limitations, and the applicable requirements of the NEC.
 - M. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc. to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway (and bus duct) prior to fabrication.
1. Right-of-Way:
- a. Lines which pitch have the right-of-way over those which do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
 - b. Make offsets, transitions and changes in direction in raceways (and bus duct) as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.
- N. Wherever the work is of sufficient complexity, prepare additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work shall be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field.

- O. Contractor shall furnish services of an experienced Superintendent, who shall be in constant charge of all work, and who shall coordinate his work with the work of other trades. No work shall be installed before coordinating with other trades.
- P. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
- Q. Where electrical connections are required, to equipment provided by the Owner or by other trades, this Contractor shall verify the exact requirements for these connections prior to ordering any materials or laying out any work. Where there is a discrepancy between the equipment being furnished and that shown on the Contract Drawings, the Contractor shall notify the Architect/Engineer for direction. Failure to comply with this coordination shall not constitute a reason for extra monies for equipment ordered or installed. Restocking charges will not be paid.

1.3 EXAMINATION OF SITE

- A. Prior to the submitting of bids, the Contractor shall visit the site of the job and shall familiarize himself with all conditions affecting the proposed installation and shall make provisions as to the cost thereof. Failure to comply with the intent of this paragraph will in no way relieve the contractor of performing all necessary work shown on the Drawings.

1.4 PROGRESS OF WORK

- 1. A. The Contractor shall order the progress of his work so as to conform to the progress of the work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Ship and store all products and materials in a manner which will protect them from damage, weather and entry of debris. If items are damaged, do not install, but take immediate steps to obtain replacement or repair. Any such repairs shall be subject to review and acceptance of the Architect/Engineer.
- B. Delivery of Materials: Deliver materials in manufacturer's unopened container fully identified with manufacturer's name, trade name, type, class, grade, size and color.
- C. Storage of Materials, Equipment and Fixtures: Store materials suitably sheltered from the elements, but readily accessibly for inspection by the Architect/Engineer until installed. Store all items, susceptible to moisture damage, in dry, heated spaces.

1.6 EQUIPMENT ACCESSORIES

- A. Provide supports, hangers and auxiliary structural members required for support of the work according to Section 26 05 29 "Hangers and Supports for Electrical Systems."
- B. Furnish and set all sleeves for passage of raceways through structural, masonry and concrete walls or floors and elsewhere as will be required for the proper protection of each raceway (and bus duct) passing through building surfaces.

- C. Wall mounted equipment may be directly secured to wall by means of steel bolts. Maintain at least 1" air space between equipment and supporting wall. Groups or arrays of equipment may be mounted on adequately sized steel angles, channels, or bars. Prefabricated steel channels providing a high degree of mounting flexibility, such as those manufactured by Kindorf, Glob-Strutt and Unistrut, may be used for mounting arrays of equipment.

1.7 CUTTING, PATCHING

- A. The work shall be carefully laid out in advance. Where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of raceway, outlets or other equipment, the work shall be carefully done. Any damage to the building, piping, equipment or defaced finish plaster, woodwork, metalwork, etc. shall be repaired by skilled mechanics or the trades involved at no additional cost to the Owner.
- B. The Contractor shall do no cutting, channeling, chasing or drilling of unfinished masonry, tile, etc., unless he first obtains permission from the Architect/Engineer. If permission is granted, the Contractor shall perform this work in a manner approved by the Architect/Engineer
- C. Where conduits, mounting channels, outlet, junction, or pull boxes are mounted on a painted surface, or a surface to be painted, they shall be painted to match the surface. Whenever support channels are cut, the bare metal shall be cold galvanized.
- D. Slots, chases, openings and recesses through floors, walls, ceilings, and roofs will be provided by the various trades in their respective materials. The trade requiring them to properly locate such openings and be responsible for any cutting and patching caused by the neglect to do so.
- E. Structural steel fabricator and installer shall be responsible for the coordination of all framed openings in roof with approved equipment manufacturers. (Openings such as, but not limited to mechanical units, exhaust fans, curb mounted equipment, roof drains, skylights, stair openings, roof hatches, smoke hatches, duct thru roof penetrations, expansion joints, etc.)

Exact sizes and exact locations of all openings are to be verified with the approved shop drawings issued for the installation. The exact sizes shall be coordinated prior to any fabrication and installation by any/all trades. (Sizes and locations indicated on contract drawings are diagrammatic and for information only.)

Any fabrication and/or installation which have not been properly coordinated with approved equipment manufacturer and must be repaired, relocated, altered, replaced, re-installed or modified in any manner will be done to the satisfaction of the Owner with no additional cost to the Owner or design professional.

1.8 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire resistance of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping".

1.9 NORMAL VOLTAGES (Unless Otherwise Noted)

- A. Primary Distribution – above 120/208 volts.
- B. Secondary Distribution – 120/208 Volt, 3 phase, 4 wire.

1.10 MOUNTING HEIGHTS

- A. Unless otherwise noted or required because of special conditions the mounting heights of all equipment shall match that in the existing building, if those mounting heights comply with A.D.A.

1.11 DEMOLITION AND CONTINUANCE OF EXISTING SERVICES

- A. All existing electrical services not specifically indicated to be removed or altered shall remain as they presently exist.
- B. Should any existing services, etc., interfere with new construction, the Contractor shall (after obtaining written approval from the Architect/Engineer) alter or reroute such existing equipment to facilitate new construction.
- C. Shut down of existing services shall be coordinated with the Owner prior to altering any existing situation. The Contractor shall notify the Owner in writing giving two (2) weeks advance notice of planned alteration. The Electrical Contractor and Owner shall develop a sequence necessary to shutdown existing services and provide temporary power to those items which must remain active.
- D. It shall be solely the Contractor's responsibility to guarantee continuity of present facilities (with respect to damage or alteration due to new construction) and any unauthorized alteration to existing equipment shall be corrected by the Contractor to the Architect/Engineer's satisfaction at the Contractor's expense.

1.12 CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean, subject to the Architect/Engineer's instructions, which shall be promptly carried out.
- B. Contractor shall clean all fixtures and equipment at the completion of the project.
- C. All switchboards, panelboards, wireways, trench ducts, cabinets, enclosures, etc. shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

1.13 WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense, using workmen skilled in that trade.

1.14 SUPPORTS AND FASTENERS

- A. Provide supports, hangers and auxiliary structural members required for support of the work according to Section 26 05 29 "Hangers and Supports for Electrical Systems" and Section 26 05 48 "Vibration and Seismic Control for Electrical Components."
- B. Furnish and set all sleeves for passage of raceways through structural, masonry and concrete walls or floors and elsewhere as will be required for the proper protection of each raceway (and bus duct) passing through building surfaces.
- C. Wall mounted equipment may be directly secured to wall by means of steel bolts. Maintain at least 1" air space between equipment and supporting wall. Groups or arrays of equipment may be mounted on

adequately sized steel angles, channels, or bars. Prefabricated steel channels providing a high degree of mounting flexibility, such as those manufactured by Kindorf, Glob-Strutt and Unistrut, may be used for mounting arrays of equipment.

1.15 PROHIBITED LABELS AND IDENTIFICATIONS

- A. Prohibited Markings: In all public areas, tenant areas and similar locations within the project, the inclusion or installation of any item, element or assembly which bears on any exposed surface any name, trademark, or other insignia which is intended to identify the manufacturer, the vendor, or other source(s) from which such object has been obtained, is prohibited. Also prohibited is the inclusion or installation of any article which bears visible evidence that an insignia, name, label, or other device had been removed.
- B. Exception: Required Underwriter's Laboratory labels shall not be removed nor shall identification specifically required under the various technical sections of the specifications be removed.

1.20 CONNECTION TO EXISTING UTILITIES AND SYSTEMS

- A. If connecting to an existing system, the Electrical Contractor shall be responsible to verify the integrity of the system being connected to. All applicable testing and acceptance will apply.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. If products and materials are specified or indicated on the Drawings for a specific item or system, use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of Shop Drawings where Shop Drawings are required or as approved in writing where Shop Drawings are not required.
- B. All equipment capacities, etc. are listed for job site operating conditions. All equipment sensitive to altitudes or ambient temperatures shall be derated and method of derating shown on Shop Drawings. Where operating conditions shown differ from the laboratory test conditions, the equipment shall be derated and the method of derating shown on Shop Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Architect/Engineer before installing any equipment. Provide a copy of such instructions at the equipment during any work on the equipment. Provide all special supports, connections, wiring, accessories, etc.
- B. Use mechanics skilled in their trade for all work.
- C. Keep all items protected before and after installation. Clean up all debris.
- D. Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.
- E. Applicable equipment and materials to be listed by Underwriters' Laboratories and Manufactured in accordance with ASME, NEMA, ANSI or IEEE standards, and as approved by local authorities having jurisdiction as mentioned in Division 1.

- F. Before commencing Work, examine all adjoining, underlying, Work on which this Work is in any way dependent for perfect workmanship and report any condition which prevents performance of first class work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.

3.2 PREMIUM TIME WORK

- A. The following Work shall be performed at night or weekend other than holiday weekends as directed and coordinated with the Owner.
1. All tie-in, cut-over and modifications to the existing electrical system and other existing system requiring tie-ins or modifications shall be arranged and scheduled with the Owner to be done at a time as to maintain continuity of the service and not interfere with normal building operations.

3.3 PROJECT MANAGEMENT AND COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specification to ensure efficient and orderly installation of each part of the work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule
 2. Preparation of the Schedule of Values
 3. Installation and removal of temporary facilities and controls
 4. Delivery and processing of submittals
 5. Progress meetings
 6. Pre-installation conferences
 7. Project closeout activities
 8. Startup and adjustment of systems
 9. Project closeout activities
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into the work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

3.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequence.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Number of Copies: Submit three opaque copies of each submittal. Architect, through Construction Manager, will return one copy.
 - a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect and Construction Manager will retain two copies; remainder will be returned. Markup and retain one returned copy as a Project Record Drawing.
 - 3. Refer to individual Sections for Coordination Drawing requirements for work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project Site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

3.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project Superintendent, provide other administrative and supervisory personnel as required for proper performance of the work.

3.6 PROJECT MEETINGS

- A. General: Attend meetings and conferences at Project Site, unless otherwise indicated.
- B. Preconstruction Conference: Attend a preconstruction conference before starting construction, at a time convenient to Owner, Construction Manager, and Architect, but no later than 15 days after execution of the Agreement.

END OF SECTION

SECTION 26 0501
SUMMARY OF WORK - ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide the Work included in accordance with the Contract Documents.
- B. Provide all labor, materials, equipment, tools, appliances, auxiliaries, services, hoisting, scaffolding, support, supervision, and Project Record Documents, and perform all operations for the furnishing and installing of the complete electrical system, including but not limited to the work described hereinafter. The work shall meet or exceed the latest codes, regulations and requirements required by the local Building Department (as mentioned in Division 01).
- C. The electrical work is shown schematically on the Drawings to indicate the general system arrangement and configuration. The work of this Division shall include coordination with the work of other Divisions of the Specifications and the Contract Documents so as to provide a complete and operational system capable of being readily operated and maintained, including approved re-arrangement of the systems and equipment and re-routing of distribution services to enable the complete system to fit within the confines of the allotted electrical spaces, all to the satisfaction of the Architect/Engineer or as directed by the Architect/Engineer.
- D. The work shall include but not limited to the following:
 - 1. Panelboards
 - 2. Feeder and branch circuits
 - 3. Wiring devices
 - 4. Lighting fixtures
 - 5. Lighting controls
 - 6. Equipment connections
 - 7. Fire alarm system rework
 - 8. Intercom/clock system rework

1.2 SETTING OUT OF WORK

- A. All equipment capacities, etc. are listed for job site operating conditions. All equipment sensitive to altitudes or ambient temperatures shall be derated and method of derating shown on the Shop Drawings.
- B. Use mechanics skilled in their trade for all work.
- C. Keep all items protected before and after installation. Clean up all debris.
- D. Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.
- E. Applicable equipment and materials shall be listed by Underwriters' Laboratories and manufactured in accordance with ASME, NEMA, ANSI or IEEE standards and as approved by local authorities having jurisdiction.
- F. Before commencing work, examine all adjoining, underlying, etc., work on which this work is in any way dependent for perfect workmanship and report any condition which prevents performance of first class work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.

1.3 MECHANICAL EQUIPMENT WIRING

- A. Provide all labor and materials required to complete electrical (power) wiring for plumbing, heating and ventilating, elevators, escalators and miscellaneous equipment, as called for in these specifications and/or shown on the Drawings.
- B. Install and wire all single phase motor protection switches and combination starters mounted within motor control centers, and disconnects as required for mechanical equipment unless otherwise specifically noted in these specifications or on the drawings. Remote starters will be provided by the trade providing the motor.
- C. Confirm final connections, loads, and locations of motors prior to ordering of equipment and installation.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 26 0505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Sustainable Design Documentation: Submit certification of removal and appropriate disposal of abandoned cables containing lead stabilizers.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Engineer before disturbing existing installation
- D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Disable system only to make switchovers and connections. Minimize outage duration.
- E. Existing Fire Alarm System: Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify Owner before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- F. Repair adjacent construction and finishes damaged during demolition and extension work.
- G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.

- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel unless otherwise indicated.
 - b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 1. Comply with MFMA-4.
 2. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
 3. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
 - c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
- F. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Hollow Stud Walls: Use toggle bolts.
 4. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 5. Sheet Metal: Use sheet metal screws.
 6. Wood: Use wood screws.
 7. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

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

END OF SECTION

SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. Flexible metal conduit (FMC).
- D. Liquid tight flexible metal conduit (LFMC).
- E. Electrical metallic tubing (EMT).
- F. Conduit fittings.
- G. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- I. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- J. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- K. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- L. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- M. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify []ngineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- D. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- E. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- F. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- G. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
- H. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
- I. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 1/2 inch (16 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 1/2 inch (16 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.07 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.08 ACCESSORIES

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.

- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 4. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - 5. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 7. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 - 8. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 9. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 - 10. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
 - 11. Group parallel conduits in the same area together on a common rack.
- F. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 - 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 - 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 - 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 - 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 - 8. Use of spring steel conduit clips for support of conduits is not permitted.
 - 9. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- G. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- H. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 5. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- I. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where conduits are subject to earth movement by settlement or frost.
- J. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting at an accessible point near the penetration to prevent condensation.
1. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

3.03 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.04 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

1.02 RELATED REQUIREMENTS

- A. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 2726 - Wiring Devices:
 - 1. Wall plates.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels; 2013.
- J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 - 6. Coordinate the work with other trades to preserve insulation integrity.
 - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit is used.
 4. Use suitable concrete type boxes where flush-mounted in concrete.
 5. Use suitable masonry type boxes where flush-mounted in masonry walls.
 6. Use raised covers suitable for the type of wall construction and device configuration where required.
 7. Use shallow boxes where required by the type of wall construction.
 8. Do not use "through-wall" boxes designed for access from both sides of wall.
 9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 12. Wall Plates: Comply with Section 26 2726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that mounting surfaces are ready to receive boxes.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

- E. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required.
 - 2. Locate boxes so that wall plates do not span different building finishes.
 - 3. Locate boxes so that wall plates do not cross masonry joints.
 - 4. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
- F. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- G. Install boxes plumb and level.
- H. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- I. Install boxes as required to preserve insulation integrity.
- J. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- K. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- L. Close unused box openings.
- M. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- N. Provide grounding and bonding in accordance with Section 26 0526.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Voltage markers.
- D. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.

1.05 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - 2. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
 - 3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
 - 4. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
 - 5. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
 - 6. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
 - a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
- C. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit

distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 - 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 - 4. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
 - 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for General Information and Operating Instructions:
 - 1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/4 inch (6 mm).
 - 5. Color: Black text on white background unless otherwise indicated.
- D. Format for Caution and Warning Messages:
 - 1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/2 inch (13 mm).
 - 5. Color: Black text on yellow background unless otherwise indicated.

2.03 VOLTAGE MARKERS

- A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- B. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
- C. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
- D. Color: Black text on orange background unless otherwise indicated.

2.04 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
 - 1. Materials:
 - 2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Interior Components: Legible from the point of access.
 6. Conductors and Cables: Legible from the point of access.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

END OF SECTION

SECTION 26 0583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 0533.13 - Conduit for Electrical Systems.
- C. Section 26 0533.16 - Boxes for Electrical Systems.
- D. Section 26 2726 - Wiring Devices.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 EQUIPMENT CONNECTIONS

PART 3 EXECUTION

3.01 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Lighting contactors.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- E. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.
- F. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.
- I. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Lutron Electronics Company, Inc: www.lutron.com/#sle.
 - 3. Sensor Switch Inc: www.sensorswitch.com/#sle.
 - 4. WattStopper: www.wattstopper.com/#sle.
 - 5. or approved equal.

B. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
 - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
6. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

2.03 LIGHTING CONTACTORS

A. Manufacturers:

1. ABB/GE: www.geindustrial.com/#sle.
2. Eaton Corporation: www.eaton.com/#sle.
3. Rockwell Automation Inc; Allen-Bradley Products: ab.rockwellautomation.com/#sle.
4. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
5. Siemens Industry, Inc: www.usa.siemens.com/#sle.
6. or approved equal.

B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.

C. Short Circuit Current Rating:

1. Provide contactors with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Enclosures:

1. Comply with NEMA ICS 6.
2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
3. Finish: Manufacturer's standard unless otherwise indicated.

2.04 ACCESSORIES

A. Auxiliary Contacts:

1. Comply with NEMA ICS 5.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

B. Control and Timing Relays:

1. Comply with NEMA ICS 5.
2. Provide number and type of relays indicated or required to perform necessary functions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.
- G. Provide required supports in accordance with Section 26 0529.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

3.03 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- E. NEMA PB 1 - Panelboards; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 67 - Panelboards; Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- M. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.geindustrial.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. or approved equal.
- F. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase and Neutral Bus Material: Copper.
 - 2. Ground Bus Material: Copper.

- D. Circuit Breakers:
 - 1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
- E. Enclosures:
 - 1. Provide surface-mounted enclosures unless otherwise indicated.
 - 2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 - 3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - 3. Conductor Terminations:
 - a. Lug Material: Copper, suitable for terminating copper conductors only.
 - 4. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

2.05 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 0529.
- F. Install panelboards plumb.
- G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- H. Install all field-installed branch devices, components, and accessories.
- I. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- J. Provide filler plates to cover unused spaces in panelboards.

3.02 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- C. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.03 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.

- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 26 2419
MOTOR-CONTROL CENTERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Low-voltage (600 V and less) standard (non-arc-resistant) NEMA motor control centers.
- B. Motor control center units:
 - 1. Feeder units.
 - 2. Combination magnetic motor starter units.
- C. Overcurrent protective devices for motor control centers and associated units, including overload relays.
- D. Motor control accessories:
 - 1. Auxiliary contacts.
 - 2. Pilot devices.
 - 3. Control and timing relays.
 - 4. Control power transformers.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Revision E with Supplement 1, 2013.
- B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 402 - Standard for Installing and Maintaining Motor Control Centers; 2014.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.
- G. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers; 1995 (R2008).
- H. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2000 (R2010).
- I. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (R2011).
- J. NEMA ICS 18 - Motor Control Centers; 2001 (R2007).
- K. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- N. UL 845 - Motor Control Centers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
 - 3. Coordinate the work to provide motor controllers and associated wiring suitable for interface with control devices to be installed.
 - 4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

6. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
7. Notify ☐ Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor control centers, enclosures, units, overcurrent protective devices, and other installed components and accessories.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store motor control centers in accordance with manufacturer's instructions, NECA 402, and NEMA ICS 2.3.
- B. Store in a clean, dry space having a uniform temperature to prevent condensation. Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.
- C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Motor Control Centers - Other Acceptable Manufacturers:
 1. Eaton Corporation: www.eaton.com.
 2. General Electric Company: www.geindustrial.com.
 3. Rockwell Automation, Inc.; Allen-Bradley Products: ab.rockwellautomation.com.
 4. Schneider Electric; Square D Products: www.schneider-electric.us.
 5. Siemens Industry, Inc: www.usa.siemens.com.
 6. or approved equal.

2.02 MOTOR CONTROL CENTERS

- A. Provide motor control centers consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Dead-front standard (non-arc-resistant) type motor control center assemblies complying with NEMA ICS 18, and listed and labeled as complying with UL 845; ratings, configurations and features as indicated on the drawings.
- D. Configuration:
 1. Arrangement: Front- and rear-mounted units.
 2. NEMA Classification and Wiring Type: NEMA ICS 18, Class I, Type B (B-T for units size 3 or smaller).
- E. Service Conditions:
 1. Provide motor control centers and associated components suitable for operation under the following service conditions without derating:
 - a. Altitude:
 - 1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet (1,000 m).
 - 2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet (2,000 m).
 - b. Ambient Temperature: Between 32 degrees F (0 degrees C) and 104 degrees F (40 degrees C).

2. Provide motor control centers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- F. Short Circuit Current Rating:
 1. Minimum Rating: 42,000 rms symmetrical amperes.
 2. Label equipment utilizing series ratings as required by NFPA 70.
- G. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- H. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- I. Bussing:
 1. Horizontal Main Bus: Size for a maximum temperature rise of 117 degrees F (65 degrees C) over an ambient temperature of 104 degrees F (40 degrees C), in compliance with NEMA ICS 18 and UL 845 requirements.
 2. Vertical Bus: Minimum size of 300 A, in compliance with NEMA ICS 18 requirements.
 3. Provide solidly bonded equipment ground bus through full length of motor control center, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 4. Phase and Neutral Bus Material: Copper.
 5. Ground Bus Material: Copper.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
 1. Line Conductor Terminations:
 - a. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
 - b. Main and Neutral Lug Type: Mechanical.
- K. Enclosures:
 1. Comply with NEMA ICS 6.
 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).
 3. Finish: Manufacturer's standard unless otherwise indicated.
- L. Future Provisions:
 1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- M. Instrument Transformers:
 1. Comply with IEEE C57.13.
 2. Select suitable ratio, burden, and accuracy as required for connected devices.
 3. Current Transformers: Connect secondaries to shorting terminal blocks.
 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.03 MOTOR CONTROL CENTER UNITS

- A. Feeder Units: Circuit breaker type.
- B. Combination Magnetic Motor Starter Units:
 1. Description: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).
 2. Configuration: Full-voltage non-reversing type unless otherwise indicated.
 3. Disconnects: Circuit breaker type.
 - a. Circuit Breakers: Motor circuit protectors (magnetic-only) unless otherwise indicated or required.
 - b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
 - c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
 4. Overload Relays: Bimetallic thermal type unless otherwise indicated.

2.04 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:

1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
3. Trip-free operation.
4. Visible trip indication.
5. Resettable.
 - a. Employ manual reset unless otherwise indicated.
 - b. Do not employ automatic reset with two-wire control.
6. Bimetallic Thermal Overload Relays:
 - a. Interchangeable current elements/heaters.
 - b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
 - c. Trip test function.

B. Circuit Breakers:

1. Interrupting Capacity (not applicable to motor circuit protectors):
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
2. Motor Circuit Protectors:
 - a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of a listed combination motor controller with overload protection; ratings, configurations, and features as indicated on the drawings.
 - b. Provide field-adjustable magnetic instantaneous trip setting.
3. Molded Case Circuit Breakers:
 - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - b. Minimum Interrupting Capacity:
 - c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - d. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - 1) Provide the following field-adjustable trip response settings:
 - (a) Short time pickup and delay.
 - (b) Instantaneous pickup.
 - e. Provide the following features and accessories where indicated or where required to complete installation:
 - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
4. Insulated Case Circuit Breakers:
 - a. Description: Quick-make, quick-break, trip-free circuit breakers with two-step stored energy closing mechanism; standard 80 percent rated unless otherwise indicated; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated[.]
 - b. Operation:
 - 1) Provide manually operated circuit breakers unless otherwise indicated.
 - c. Construction:
 - 1) Provide fixed-mount circuit breakers unless otherwise indicated.
 - d. Minimum Interrupting Capacity:

- 1) 42,000 rms symmetrical amperes at 240 VAC or 208 VAC.
- e. Trip Units: Solid state, microprocessor-based, true rms sensing.
- f. Provide the following circuit breaker types where indicated:
 - 1) 100 Percent Rated Circuit Breakers: Listed for application within the switchboard where installed at 100 percent of the continuous current rating.
 - 2) Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.

2.05 MOTOR CONTROL ACCESSORIES

- A. Auxiliary Contacts:
 - 1. Comply with NEMA ICS 5.
 - 2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each starter unit, minimum.
- B. Pilot Devices:
 - 1. Comply with NEMA ICS 5; heavy-duty type.
 - 2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
 - 3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
 - 4. Indicating Lights: Push-to-test type unless otherwise indicated.
 - 5. Provide LED lamp source for indicating lights and illuminated devices.
- C. Control and Timing Relays:
 - 1. Comply with NEMA ICS 5.
 - 2. Provide number and type of relays indicated or required to perform necessary functions.
- D. Control Power Transformers:
 - 1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices, plus 50 percent spare capacity.
 - 2. Include primary and secondary fuses.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install motor control centers in accordance with NECA 1 (general workmanship), NECA 402, and NEMA ICS 2.3.
- C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.
- D. Provide required support and attachment components in accordance with Section 26 0529.
- E. Install motor control centers plumb and level.
- F. Unless otherwise indicated, mount motor control centers on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 03 3000.
- G. Provide grounding and bonding in accordance with Section 26 0526.
- H. Install all field-installed devices, components, and accessories.
- I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- J. Set field-adjustable motor controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.
- K. Provide filler plates to cover unused spaces.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

- B. Before energizing motor control center, perform insulation resistance testing in accordance with NECA 402 and NEMA ICS 2.3.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform inspections and tests listed in NETA ATS, Section 7.16.2.1.
- E. Motor Starters: Perform inspections and tests listed in NETA ATS, Section 7.16.1.1. Tests listed as optional are not required.
- F. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.
- G. Test shunt trips to verify proper operation.
- H. Correct deficiencies and replace damaged or defective motor control centers or associated components.

3.03 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of motor control center covers and doors.

3.04 CLEANING

- A. Clean dirt and debris from motor control center enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred surfaces to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

- A. Training: Train Owner's personnel on operation, adjustment, and maintenance of motor control center and associated devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Location: At project site.

3.06 PROTECTION

- A. Protect installed motor control centers from subsequent construction operations.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Receptacles.
- B. Wall plates.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Revision H, 2014.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R2015).
- E. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 4. Notify []ngineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Field Quality Control Test Reports.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

2.02 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
- C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

2.03 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell-wiring.com.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com.

3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/sle.
 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
 5. or approved equal.
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 2. NEMA configurations specified are according to NEMA WD 6.
- C. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - a. Provide test and reset buttons of same color as device.
 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

2.04 WALL PLATES

- A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com.
 2. Leviton Manufacturing Company, Inc: www.leviton.com.
 3. Lutron Electronics Company, Inc: www.lutron.com/sle.
 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
 5. or approved equal.
- B. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Standard.
 3. Screws: Metal with slotted heads finished to match wall plate finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- I. Install wall switches with OFF position down.
- J. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- K. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- L. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.03 FIELD QUALITY CONTROL

- A. Inspect each wiring device for damage and defects.
- B. Test each receptacle to verify operation and proper polarity.
- C. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- D. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.04 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.05 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 2816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed circuit breakers.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- E. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- F. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.05 FIELD CONDITIONS

- A. Maintain ambient temperature between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed circuit breakers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation: www.eaton.com.
- B. General Electric Company: www.geindustrial.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Siemens Industry, Inc: www.usa.siemens.com.
- E. or approved equal.

2.02 ENCLOSED CIRCUIT BREAKERS

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- D. Short Circuit Current Rating:
 - 1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.
- E. Conductor Terminations: Suitable for use with the conductors to be installed.
- F. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

- G. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- H. Provide externally operable handle with means for locking in the OFF position.

2.03 MOLDED CASE CIRCUIT BREAKERS

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- B. Interrupting Capacity:
 - 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- C. Conductor Terminations:
 - 1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- D. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.
- B. Verify that mounting surfaces are ready to receive enclosed circuit breakers.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Install enclosed circuit breakers plumb.

3.03 FIELD QUALITY CONTROL

- A. Test GFCI circuit breakers to verify proper operation.
- B. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

END OF SECTION

SECTION 26 2923

VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Variable frequency controllers.

1.02 REFERENCE STANDARDS

- A. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems; 2014.
- B. NEMA ICS 7 - Industrial Control and Systems: Adjustable-Speed Drives; 2014.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Reliance Electric/Rockwell Automation: www.reliance.com.
- B. Siemens Energy & Automation: www.sea.siemens.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Bell & Gossett Xylem
- E. or approved equal.

2.02 DESCRIPTION

- A. Variable Frequency Controllers: Enclosed controllers suitable for operating the indicated loads, in conformance with requirements of NEMA ICS 7. Select unspecified features and options in accordance with NEMA ICS 3.1.

2.03 OPERATING REQUIREMENTS

- A. Rated Input Voltage: 208 volts, three phase, 60 Hertz.
- B. Volts Per Hertz Adjustment: Plus or minus 10 percent.
- C. Current Limit Adjustment: 60 to 110 percent of rated.
- D. Acceleration Rate Adjustment: 0.5 to 30 seconds.
- E. Deceleration Rate Adjustment: 1 to 30 seconds.

2.04 COMPONENTS

- A. Display: Provide integral digital display to indicate output voltage, output frequency, and output current.
- B. Status Indicators: Separate indicators for overcurrent, overvoltage, ground fault, overtemperature, and input power ON.
- C. Furnish HAND-OFF-AUTOMATIC selector switch and manual speed control.

2.05 SOURCE QUALITY CONTROL

- A. Shop inspect and perform standard productions tests for each controller.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surface is suitable for controller installation.
- B. Do not install controller until building environment can be maintained within the service conditions required by the manufacturer.

3.02 INSTALLATION

- A. Install in accordance with NEMA ICS 7.1 and manufacturer's instructions.
- B. Tighten accessible connections and mechanical fasteners after placing controller.

3.03 ADJUSTING

- A. Make final adjustments to installed controller to assure proper operation of load system. Obtain performance requirements from installer of driven loads.

3.04 CLOSEOUT ACTIVITIES

- A. Demonstrate operation of controllers in automatic and manual modes.

3.05 MAINTENANCE

- A. Provide service and maintenance of controllers for one year from Date of Substantial Completion.

END OF SECTION

SECTION 28 4600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm system, including all components, wiring, and conduit.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system.

1.03 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. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 72 - National Fire Alarm and Signaling Code; 2016.
- F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
 - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
 - 3. Certification by Contractor that the system design will comply with Contract Documents.
- C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 - 4. System zone boundaries and interfaces to fire safety systems.
 - 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 - 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 - 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 - 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 - 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
 - 10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.

11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
 12. Certification by Contractor that the system design complies with Contract Documents.
 13. Do not show existing components to be removed.
- D. Evidence of instructor qualifications; training lesson plan outline.
- E. Evidence of maintenance contractor qualifications, if different from installer.
- F. Inspection and Test Reports:
1. Submit NFPA 72 "Inspection and Test Form," filled out.
- G. Project Record Documents: See Section 01 7800 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- H. Closeout Documents:
1. Certification by manufacturer that the equipment has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm equipment of the specified type and providing contract maintenance service as a regular part of their business.
- B. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
- C. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.06 WARRANTY

- A. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Alarm Control Units and Accessories - Basis of Design: Match existing manufacturer compatible with type and style..
- B. Fire Alarm Control Units and Accessories - Other Acceptable Manufacturers:
1. Provide control units made by the same manufacturer.
- C. Initiating Devices and Notification Appliances:
1. Same manufacturer as control units.
 2. Provide initiating devices and notification appliances made by the same manufacturer, where possible.
- D. Substitutions: See Section 01 6000 - Product Requirements.
1. For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with Contract Documents.
 2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with Contract Documents.

2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide new extensions to the automatic fire detection and alarm system:

1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
- B. Power Sources:
 1. Primary: Dedicated branch circuits of the facility power distribution system.
 2. Secondary: Storage batteries.
 3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
 4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
 1. Chute interlocks and controls.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
 1. Duct smoke detectors.
- C. HVAC:
 1. Duct Smoke Detectors: Close dampers indicated; shut down exhaust fans indicated.
- D. Doors:
 1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 7100.
 2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 08 7100.

2.04 COMPONENTS

- A. General:
 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Initiating Devices:
 1. Addressable Systems:
 - a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
 - b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
 2. Manual Pull Stations: Provide and install or reuse existing if applicable.
- D. Notification Appliances:
 1. Strobes
 2. Horn Strobes
- E. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.
- F. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
- G. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
 2. Provide one for each control unit where operations are to be performed.
 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
 4. Provide extra copy with operation and maintenance data submittal.
- H. CARBON MONOXIDE DETECTORS

1. General: Carbon monoxide detector listed for connection to fire-alarm system.
 - a. Mounting: Adapter plate for outlet box mounting.
 - b. Testable by introducing test carbon monoxide into the sensing cell.
 - c. Detector shall provide alarm contacts and trouble contacts.
 - d. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
 - e. Comply with UL 2075.
 - f. Locate, mount, and wire according to manufacturer's written instructions.
 - g. Provide means for addressable connection to fire-alarm system.
 - h. Test button simulates an alarm condition.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 OWNER PERSONNEL INSTRUCTION

- A. Provide the following instruction to designated Owner personnel:
 1. Hands-On Instruction: On-site, using operational system.
 2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
- B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
 1. Initial Training: 1 session pre-closeout.
- C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
 1. Initial Training: 1 session pre-closeout.
- D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
 1. Be prepared to conduct any of the required tests.
 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.

3. Have authorized technical representative of control unit manufacturer present during demonstration.
 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
 5. Repeat demonstration until successful.
- B. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
1. Approved operating and maintenance data has been delivered.
 2. All aspects of operation have been demonstrated to Owner.
 3. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
 4. Specified pre-closeout instruction is complete.

3.05 MAINTENANCE

- A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- C. Comply with Owner's requirements for access to facility and security.

END OF SECTION

**SECTION 31 2316
EXCAVATION**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavating for building volume below grade, footings, and slabs-on-grade.
- B. Trenching for utilities outside the building to utility main connections.

1.2 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Bedding and Fill to Correct Over-Excavation:
 - 1. See Section 31 2323 for bedding and corrective fill materials at general excavations.

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.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain and protect from damage.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Protect plants, lawns, rock outcroppings, and other features to remain.
- E. 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 Engineer.

3.3 EXCAVATING

- A. Excavate to accommodate new structures and construction operations.
 - 1. Excavate to the specified elevations.
 - 2. 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.
 - 3. Cut utility trenches wide enough to allow inspection of installed utilities.
 - 4. Hand trim excavations. Remove loose matter.
- B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Provide temporary means and methods, as required, to remove all water from excavations until directed by Engineer. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4 SUBGRADE PREPARATION

- A. See Section 31 2323 for subgrade preparation at general excavations.

3.5 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. See Section 31 2323 for fill, backfill, and compaction requirements at general excavations.

3.6 REPAIR

- A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

3.7 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 Engineer before placement of foundations.

3.8 CLEANING

- A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.
- B. Remove excavated material that is unsuitable for re-use from site.
- C. Remove excess excavated material from site.

3.9 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.

END OF SECTION

**SECTION 31 2323
FILL**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Filling, backfilling, and compacting for building volume below grade.
- B. Backfilling and compacting for utilities outside the building to utility main connections.

1.2 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

1.3 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: 4 inches (100 mm) below finish grade elevations indicated on drawings, unless otherwise indicated.

1.4 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2015.
- B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- H. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data for Manufactured Fill.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- D. Compaction Density Test Reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. General Fill: Subsoil excavated on-site.
 1. Graded.
 2. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.
 3. Complying with ASTM D2487 Group Symbol CL.
- B. Granular Fill - Gravel : Pit run washed stone; free of shale, clay, friable material and debris.
 1. Graded in accordance with ASTM C136/C136M, within the following limits:
 - a. 3/4 inch (19 mm) sieve: 95 to 100 percent passing.
 - b. 5/8 inch (16 mm) sieve: 75 to 100 percent passing.
 - c. 3/8 inch (9 mm) sieve: 55 to 85 percent passing.
 - d. No. 4 (4.75 mm) sieve: 35 to 60 percent passing.

2.2 ACCESSORIES

- A. Vapor Retarder: 10 mil (0.25 mm) thick, polyethylene.

2.3 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- C. Verify structural ability of unsupported walls to support imposed loads by the fill.
- D. Verify areas to be filled are not compromised with surface or ground water.

3.2 PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 6 inches (150 mm) to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.3 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- F. Correct areas that are over-excavated.

1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- G. Compaction Density Unless Otherwise Specified or Indicated:
 1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
 2. At other locations: 95 percent of maximum dry density.
- H. Reshape and re-compact fills subjected to vehicular traffic.
- I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4 FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Under Interior Slabs-On-Grade:
 1. Use granular fill.
 2. Depth: 4 inches (100 mm) deep.
 3. Compact to 95 percent of maximum dry density.
- C. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:
 1. Bedding: Use sand.
 2. Cover with general fill.
 3. Fill up to subgrade elevation.
 4. Compact in maximum 8 inch (200 mm) lifts to 95 percent of maximum dry density.
- D. At Lawn Areas:
 1. Use general fill.
 2. Fill up to subgrade elevations.
 3. Compact to 95 percent of maximum dry density.

3.5 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch (25 mm) from required elevations.

3.6 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Soil Fill Materials:
 1. Compaction density testing will be performed on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938. Testing agency will be retained by the Owner. Cooperate with testing protocols.
 2. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
 3. If tests indicate work does not meet specified requirements, remove work, replace and retest.
 4. Frequency of Tests: As determined by testing agency..

3.7 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

**SECTION 32 9219
SEEDING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Seeding, mulching and fertilizer.

1.2 RELATED REQUIREMENTS

- A. Section 31 2323 - Fill: Topsoil material.

1.3 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.1 SEED MIXTURE

- A. Seed Mixture:
 - 1. American Kentucky Blue Grass: 20 percent.
 - 2. Devine Perennial Rye: 20%
 - 3. Apollo Kentucky Bluegrass: 20%
 - 4. Limousine Kentucky Bluegrass: 20%
 - 5. Midnight Kentucky Bluegrass: 20%

2.2 SOIL MATERIALS

- A. Topsoil: 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; pH value of minimum 5.4 and maximum 7.0.

2.3 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- B. Fertilizer: Recommended for grass, with 50 percent of the elements derived from organic sources; of proportion necessary to eliminate deficiencies of topsoil, as indicated by analysis.
- C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section.

3.2 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to roller compaction.

**SECTION 32 9219
SEEDING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Preparation of subsoil.
- B. Placing topsoil.
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PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section.

3.2 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to roller compaction.

- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.3 SEEDING

- A. Apply seed at a rate of 10 lbs per 1000 sq ft (48.4 Kg per 1000 sq m) evenly in two intersecting directions. Rake in lightly.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- D. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.
- E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.
- F. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches (100 by 100 mm).

END OF SECTION