SED NO. 13-02-00-01-0-020-013

TETRA TECH
ARCHITECTS & ENGINEERS

10 Brown Rd.
Ithaca, NY 14850
607-277-7100

Farmingdale, New York
Albany, New York
Ithaca, New York

BEACON CITY SCHOOL DISTRICT

BEACON, NEW YORK

PROJECT NO. 279180-24002.1

RECONSTRUCTION TO
BEACON HIGH SCHOOL

MARCH 28, 2025

To the best of the Architect's knowledge, information and belief, the design of this project conforms to all applicable provisions of the New York State Uniform Fire Prevention and Building Code, the New York State Energy Conservation Construction Code, and the building standards of the New York State Education Department.

BID SET
SET NO. _____

TABLE OF CONTENTS

PROJECT MANUAL

Volume 1

BIDDING REQUIREMENTS AND CONDITIONS OF THE CONTRACT

PLEASE NOTE

All sections of the following **SPECIFICATIONS** are sequentially numbered, beginning with Page 1 and concluding with the last numbered page bearing the marking "END OF SECTION -- -- --".

Sections may include additional attachments as noted in following list of Specification sections.

SPECIFICATIONS

LIST OF DRAWING SHEETS

GENERAL
G001 Title Sheet
G100 Symbols and Abbreviations

Beacon City High School

CODE COMPLIANCE
FG350 Code Compliance Review
FG351 Code Compliance First Floor
FG352 Code Compliance Second Floor

MECHANICAL
FM050 First Floor Key Plan
FM100 First Floor and Yard Demolition Plan
FM130 Boiler Room and Equipment Yard - Piping Plan
FM200 Hot and Chilled Water Boiler Room Piping Schematics
FM500 Details
FM600 Schedules and Controls

ELECTRICAL
FE050 First Floor Key Plan
FE100 First Floor and Yard Demolition Plan
FE160 First Floor Power Plan
FE500 Details

CIVIL
FC100 Site Demolition and Layout Plans and Site Details

All drawings dated March 28, 2025.

NOTICE TO BIDDERS

NOTICE IS HEREBY GIVEN, that sealed Bids, in duplicate, are sought and requested by the Board of Education, Beacon City School District (hereinafter called "Owner"), for the Reconstruction to: Beacon High School.

Separate Bids are requested for the Prime Contracts for:

Mechanical Work MC
Electrical Work EC

in accordance with the Drawings, Project Manual (including Conditions of the Contract and Specifications), and other Bidding and Contract Documents prepared by:

Tetra Tech Engineers, Architects & Landscape Architects, P.C. d/b/a
Tetra Tech Architects & Engineers
10 Brown Rd.
Ithaca, NY 14850

Pre-bid walk throughs for potential Bidders and other interested parties to be coordinated with the District's Director of Facilities at 845-838-6900 Ext. 2014.

Sealed Bids will be received by the Owner until **Thursday, July 17, 2025 at 1:00 p.m.**, local time at the District Office Conference Room, 10 Education Drive, Beacon, New York 12508 at which time and place Bids received will be publicly opened and read aloud.

For the convenience of potential Bidders and other interested parties, the Bidding Documents may be examined at the following locations:

Beacon City School District, 10 Education Drive, Beacon, NY 12508
Tetra Tech Architects & Engineers, 10 Brown Rd., Ithaca, NY 14850

Complete digital sets of Bidding Documents, drawings and specifications, may be obtained online as a download at www.tetratechaeprojectplanroom.com 'public projects' for a non-refundable fee of $49.00 (Forty Nine Dollars).

Complete hard copy sets of Bidding Documents, drawings and specifications, may be obtained online at www.tetratechaeprojectplanroom.com 'public projects'. Checks shall be made payable to **Beacon City School District** in the sum of $100.00 (One Hundred Dollars) for each set of documents. A scanned copy of the deposit check can be emailed to projects@revplans.com. Once the scanned copy of the executed deposit check is received, Bidding Documents will be shipped. Mail checks to Lohrius Blueprint, 226 Newtown Road, Plainview, New York 11803. Plan deposit is refundable in accordance with the terms in the Instructions to Bidders to all submitting bids. Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs (either by providing FedEX/UPS account number or being charged a flat rate by the printer).

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

All bid addenda will be transmitted to registered plan holders, regardless of receiving electronic or hard copy Bid Documents, via email and will be available at www.tetratechaeprojectplanroom.com. Registered plan holders who have paid for hard copies of the bid documents will need to make the determination if hard copies of the addenda are required for their use, and coordinate directly with REV for hard copies of addenda to be issued. There will be no charge for registered plan holders to obtain hard copies of the bid addenda.

As bid security, each Bid shall be accompanied by a certified check or Bid Bond made payable to the Owner, in accordance with the amounts and terms described in the Instructions to Bidders.

The Owner requires Bids comply with bidding requirements indicated in the Instructions to Bidders. The Owner may, at its discretion, waive informalities in Bids, but is not obligated to do so, nor does it represent that it will do so. The Owner also reserves the right to reject any and all Bids. The Owner will not waive informalities which would give one Bidder substantial advantage or benefit not enjoyed by all affected Bidders. Bids may not be withdrawn before 45 days following the Bid opening thereof, unless an error is claimed by the Bidder in accordance with the Instructions to Bidders.

INSTRUCTIONS TO BIDDERS

ARTICLE 1
PROJECT AND BIDDING INFORMATION

1. Project Identification: Reconstruction to: Beacon High School.

   a. Project Locations:

      1) Beacon High School: 101 Matteawan Road, Beacon, NY 12508.

2. Owner: Beacon City School District.

   a. Address: 10 Education Drive, Beacon, NY 12508.

3. Bid Opening: Bids will be received until the following Bid opening date and time, at the following location:

   a. Bid Opening Date and Time: **Thursday, July 17, 2025 at 1:00 p.m**., local time.

   b. Bid Opening Location: District Office Conference Room, 10 Education Drive, Beacon, New York 12508.

4. Bidders are invited to submit Bids for any, or all, of the following Prime Contracts:

   a. Mechanical Work Contract MC
   b. Electrical Work Contract EC

5. Access to the Project Site: Subject to Owner's prior approval of timing, Bidders will be permitted access to Project site on Monday through Friday, from 9:00 a.m. until 2:00 p.m., except legal holidays.

   a. Contact Construction Manager below, prior to visiting Project site, to arrange access.

      1. UW Marx, Inc. – Jeff West (518) 272-2541.

6. Pre-Bid Conference: A pre-bid conference for potential Bidders and other interested parties will be held as follows:

    1) Pre-Bid Conference Date, Times and Location: To be coordinated with the District's Director of Facilities at 845-838-6900 Ext. 2014.

    2) **Special Instructions: Each attendee must show proper photo identification at check-in to be put into Owner's RAPTOR Visitor ID system prior to access of each building.**

7. Agreement Form: The following will be used as the basis for the form of agreement between the Owner and the Contractor (Owner-Contractor Agreement):

    a. Standard Form of Agreement Between Owner and Contractor, AIA Document A132.

ARTICLE 2
DEFINITIONS

1. Definitions in the General Conditions of the Contract for Construction, AIA Document A201 A232, or in other Contract Documents are applicable to the Bidding Documents.

    a. "Addenda": Written or graphic instruments issued by the Architect prior to execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications, or corrections.

    b. "Bid": Complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

        1) "Base Bid": Sum stated in the Bid for which Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated for Alternates.

        2) "Alternates": Amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

    c. "Bidder": Person or entity who submits a Bid.

ARTICLE 3
BIDDING PROCEDURES

1. Bid Form: Complete the Bid Form provided, in duplicate, with all blank spaces for Base Bid and Alternates legibly completed in ink, or typewritten, in both words and figures.

    a. In the event of a discrepancy between amounts written in words and figures, the amount written in words shall govern.
    b. Bid Forms without amounts expressed both in words and figures will not be accepted.

2. Bid Attachments: Complete and submit the following attachments with the Bid Form:

    a. Attachment #1: Non-Collusive Bidding Certification.
    b. Attachment #2: Certified Corporate Resolution.
    c. Attachment #3: Iranian Energy Divestment Certification

d. Attachment #4: Certificate on Violations
e. Attachment #5: Subcontractors List
f. Attachment #6: Bidder's Qualifications
g. Attachment #7: Insurance Certification Form
h. Proposed subcontractor form 00 43 36

3. Bid Security:

   a. Submit, with the Bid Form, bid security in the amount of five percent of the Base Bid, in any of the following forms:

      1) Certified check, payable to the Owner; or

      2) Bid Bond, payable to the Owner, on Bid Bond, AIA Document A310, or standard bid bond form, duly executed by the Bidder as principal, with a surety company acceptable to the Owner.

         a) Affix a certified and current copy of the power of attorney for the attorney-in-fact who executes the required bond on behalf of the surety.

   b. Within three days following the Bid opening, bid security will be returned to all Bidders, except the three apparent lowest Bidders.

      1) Within three days following execution of the Owner-Contractor Agreement, bid security will be returned to the three apparent lowest Bidders.

      2) If the Owner-Contractor Agreement has not been executed within 45 days following the Bid opening, bid security will be returned to the three apparent lowest Bidders, except as noted below.

   c. Should the accepted Bidder, within 10 days following Notice of Award, fail or refuse to execute the Owner-Contractor Agreement and to provide the required performance and payment bonds, the accepted Bidder will be deemed to have abandoned the Contract and its bid security will be forfeited to the Owner.

4. Bid Submission: Submit each Bid, including attachments, in a sealed envelope bearing the Bidder's name and address, name of Contract, and name of Project. Deliver Bid to location specified no later than the Bid opening date and time indicated. Any Bid received after the Bid opening date and time indicated will be returned unopened.

5. Bid Withdrawal:

   a. Bid may be withdrawn by the Bidder up until the date and time specified for opening of Bids.

   b. Following the Bid opening, Bid may not be withdrawn before 45 days following the Bid opening, except in the case of Bidder error, as follows:

      1) If the Bidder claims an error in the Bid, submit a written notice to the Architect, within three days of the Bid opening, describing in detail the nature of the error, submitting documentary evidence or proof of such error.

         a) Failure to deliver such notice and evidence or proof, within the time frame required, constitutes a waiver of Bidder's right to claim error.

2) Upon receipt of required notice and evidence or proof, the Owner, in consultation with the Architect, will determine if an excusable error has been made; and if so, the Owner may permit the Bid to be withdrawn. The Owner's determination will be conclusive upon the Bidder, its surety, and all who claim rights under the Bidder.

ARTICLE 4
BIDDING DOCUMENTS

1. Bidding Documents include the bidding requirements and the proposed Contract Documents, as follows:

   a. Bidding requirements consist of the following:

      1) Notice to Bidders.
      2) Instructions to Bidders.
      3) Bid Form, with 7 attachments.

   b. Proposed Contract Documents consist of the following:

      1) Owner-Contractor Agreement.
      2) Conditions of the Contract.
      3) Drawings.
      4) Specifications.
      5) Addenda.

2. Bidding Document Interpretations or Corrections:

   a. Submit requests for Bidding Document interpretation to the Architect, in writing using the provided Pre-Bid Request for Interpretation Form, at least five working days prior to the Bid opening.

   b. Interpretations or corrections will be issued in the form of written Addenda. The Architect will not make oral interpretations or corrections.

   c. Notification of addenda will be transmitted to registered plan holders via email and will be available to download at www.tetratechaeprojectplanroom.com under "public projects".

      1) Failure of any Bidder to not download addenda and/or failure to receive any such Addendum by reason of not having registered as a plan holder in accordance with the bidding instructions, shall not relieve the Bidder from any obligation required by the Addendum.

3. Equivalents and Substitutions: The use of manufacturer's brand names, catalog numbers, and similar proprietary identifying data is intended to establish a standard of quality, appearance, and function for those items. It is not the intention of the Owner or the Architect to eliminate from consideration products that are equivalent in quality, appearance, and function to those identified.

   a. Equivalents are pre-award and substitutions are post-award.

   b. Equivalents:

      1) On Proposed Products Form provided, as post-Bid information, identify and list proposed equivalents to specified products as follows:

a) Applicable Specification Section and paragraph.
b) Proposed manufacturer's name, product brand name, and catalog number of proposed equivalent.
c) Note any aspect of the specified product that the proposed equivalent cannot meet.

2) Failure to identify and list proposed equivalents shall be deemed to mean the Bidder will furnish the materials or products indicated in the Contract Documents without exception.

c. Substitutions: Refer to Division 01 Specification Section "Substitution Procedures".

4. Contractor Qualifications: The Owner may make such investigations as it deems necessary to determine the ability of the Bidder to perform the Work.

a. The Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request, including the provided Bidder's Qualifications Form.

b. The Owner reserves the right to reject any Bid if the evidence submitted, or investigation of Bidder fails to satisfy the Owner that the Bidder is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

ARTICLE 5
BIDDER'S REPRESENTATIONS

1. By submitting a Bid, Bidder represents that:

a. Bidder has visited and thoroughly inspected the Project site, and has become fully informed of the conditions relating to the Project;

b. Bidder has received, read, and is thoroughly familiar with the Bidding Documents, including all Addenda issued; and

c. Bidder has prepared its Bid based on the materials, equipment and systems required by the Bidding Documents or equivalents**.**

ARTICLE 6
BID CONSIDERATION

1. Opening of Bids: At the designated Bid opening date and time, Bids received will be publicly opened and read aloud.

2. Bid Rejection:

a. The Owner requires Bids comply with bidding requirements; however, the Owner may, at its discretion, waive informalities in Bids. The Owner is not obligated to do so and does not represent that it will do so. The Owner will not waive informalities which would give one Bidder substantial advantage or benefit not enjoyed by all affected Bidders.

b. The Owner reserves the right to reject any and all Bids not deemed in the best interests of the Owner, if in its judgment the public interest will be promoted thereby.

c. The Owner reserves the right to reject as "informal" any and all Bids which, in its opinion, are incomplete, conditional, obscure, or contain irregularities of any kind.

d. In rejecting a Bid, the Owner does not forfeit its right to accept the Bid for any other Contract contained in the Project; and the rejection of a Bid is not necessarily a finding by the Owner of any facts or circumstances which would preclude the Bidder from serving as a subcontractor on any portion of the Project.

3. Bid Acceptance: The Owner intends to award the Contract to the responsible Bidder whose Bid complies with conditions to render it formal, who is able to furnish approved surety bonds, and whose Bid is the lowest number of dollars as defined below.

a. Lowest Bid may be Base Bid plus any Alternates the Owner desires to accept.
b. If the acceptance of Alternates does not change the low Bidder, the Owner reserves the right to accept any or all Alternates within 45 days following Notice of Award.

ARTICLE 7
POST-BID INFORMATION

1. Post-Bid Submittals:

a. The three apparent low Bidders shall submit the following completed forms within three days following the Bid opening:

1) Proposed Products Form.
2) Bond Certification Form.

ARTICLE 8
PERFORMANCE BOND AND PAYMENT BOND

1. Bond Requirements:

a. The successful Bidder shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder.

b. Bonds shall be obtained from a surety satisfactory to the Owner, authorized and licensed to do business in New York State, and listed in the latest issue of the U.S. Treasury Circular 570. The amount of each bond shall be equal to 100 percent of the Contract Sum. The sufficiency of the bonds is subject to the approval of the Owner and bonds deemed insufficient by the Owner may be rejected.

1. In addition, the Surety shall be rated as equal to "A" or better as to "Policy Holder Ratings", and "VII" or better as to "Financial Size Category".
2. Limitations: Bonding limits or bonding capacity refers to the limit or amount of bond on any one project.

c. Affix a certified and current copy of the power of attorney for the attorney-in-fact who executes the required bonds on behalf of the surety.

2. Time of Delivery and Form of Bonds:

a. Deliver required bonds to the Owner not later than the date the Agreement in entered into.

b. Use Performance Bond and Payment Bond, AIA Document A312, unless otherwise approved by the Owner.

ARTICLE 9
MISCELLANEOUS PROVISIONS

1. All applicable laws, ordinances, rules, and regulations of Federal, State, and other authorities having jurisdiction over the Project shall apply to the Contract throughout and will be deemed included in the Contract as though herein written out in full.

   a. Sections of the New York State Labor Law (LL) and the New York State General Municipal Law (GML) include, but are not limited to, the following:

      1) LL §220, subd. 2: Eight-hour day, 40-hour week.
      2) LL §220, subd. 3 and LL §220-d: Minimum rate of wage and supplement.
      3) LL §220-e: Prohibiting discrimination.
      4) LL §222-a: Prevention of dust hazards.
      5) GML §103-d: Statement of non-collusion in bids.
      6) GML §106-b: Payment on public work contracts.
      7) GML §108: Workmen's compensation insurance.
      8) GML §109: Assignment of public contracts.

2. Time of Completion: Refer to Division 01 Section "Project Summary – Project Schedule".

Attachment: Pre-Bid Request for Interpretation Form

END OF SECTION 00 21 13

TETRA TECH
ARCHITECTS & ENGINEERS

INSTRUCTIONS TO BIDDERS
ATTACHMENT #1:
PRE-BID REQUEST FOR INTERPRETATION FORM

SUBMIT FORM BY EMAIL TO INE.Beacon@tetratech.com

Project No.: 279180-24002.1 **Date:**

Project Name: Reconstruction to: Beacon HS

Bidder Contact Person:
Bidder Company Name:
Bidder Phone:
Bidder Email Address:

Question Pertains to:

Drawing Number:
Plan Area:
Room Number:
Drawing Detail Number:
Specification Section:

Question: (Please be specific)

Review by Architect/Engineers: **Responded By:** _____ **Date:** _____

Submit requests not less than 5 working days prior to the specified Bid Opening date and time. In the event that this question requires clarification or modification of the Bidding Documents, such written information can only be provided by formal Addendum, distributed to all plan holders.

TETRA TECH
ARCHITECTS & ENGINEERS

10 Brown Rd.
Ithaca, NY 14850
(607) 277-7100

Ithaca, New York
Farmingdale, New York
Albany, New York

BID FROM (Bidder's Name) : _____

(Address) : _____

_____

Bidder's Telephone : _____

Bidder's Facsimile (Fax) : _____

Bidder's E-mail Address (if applicable) : _____

BID FORM
(submit in duplicate)

CONTRACT: **MECHANICAL WORK MC**

PROJECT TITLE: RECONSTRUCTION AT BEACON HS

DATE: MARCH 28, 2025

PROJECT NO.: 279180-24002.1

BID TO: Beacon City School District
10 Education Drive
Beacon, New York 12508

The Bidder hereby certifies that it has examined and fully understands the requirements and intent of the Bidding Documents, including the Bidding Requirements and proposed Contract Documents; and proposes to furnish all labor, materials, and equipment necessary to complete the Work on, or before, the dates specified in the Contract Documents for the **BASE BID** sum of:

_____
(words)

_____ ($_____)
(figures)

Show all amounts in both words and figures; in the event of a discrepancy between amounts written in words and figures, the amount written in words shall govern.

LIST OF ADDENDA RECEIVED

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

BID ATTACHMENTS

Enclosed with this Bid are the following attachments:

Attachment #1 - Non-Collusive Bidding Certification.
Attachment #2 - Certified Corporate Resolution.
Attachment #3 – Iranian Energy Divestment Certification
Attachment #4 – Certification on Violations
Attachment #5 – Subcontractors List
Attachment #6 – Bidder's Qualifications
Attachment #7 – Insurance Certification

BID SECURITY

Enclosed with this Bid is bid security in the amount of five percent of the Base Bid.

PUBLIC WORK CONTRACTOR AND SUBCONTRACTOR REGISTRY

The Bidder hereby certifies that the Bidder and its subcontractors have completed the required New York State Public Work Contractor and Subcontractor Registry in accordance with the New York State Department of Labor (NYSDOL) requirements. **Bidders are required to attach to this bid form proof of registration as required by Labor Law Section 220-i as a minimum qualification and failure to provide proof of registration will disqualify a bidder.**

EXECUTION OF CONTRACT

If written notice of the acceptance of this Bid is transmitted to the undersigned within 45 days following the Bid opening, the undersigned will, within 10 days following the Notice of Award, execute and transmit a Contract in the form as required by the Architect.

This Bid may be withdrawn at any time prior to the Bid opening.

SIGNATURE

( ) NAME OF BIDDER (Corporate Name)
( )
( ) _____
(Corporate Seal)
( ) SIGNATURE (Corporate Officer)
( )
( ) _____
( )
( ) DATE: _____

Federal Employer's Identification Number: _____

BID FORM
ATTACHMENT #1

GENERAL CONDITIONS TO BID
NON-COLLUSIVE BIDDING CERTIFICATION

No bid will be accepted that does not have this form completely executed.

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 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 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;

(d) The person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification, and under the penalties of perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as to the person signing in its behalf;

(e) That attached hereto (if corporate bidder) is a certified copy of resolution authorizing the execution of this certified by the signature of this bid or proposal in behalf of the corporate bidder.

_____
(Individual)

_____
(Corporation)

Dated:_____ By _____
(Signature of Officer)

This Non-Collusive Bidding Certificate must be submitted with the bid.

BID FORM
ATTACHMENT #2

CERTIFIED CORPORATE RESOLUTION

RESOLVED THAT _____ be authorized to sign and submit the bid or proposal of this corporation for the following project:

_____

_____

and to include in such bid or proposal the certificate as to non-collusion required by section one hundred three-d (103-d) of the general municipal law as to the act and deed of such corporation, and for any inaccuracies or mis-statements in such certificate this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution and adopted by

_____ at a meeting of its board of directors held on the

_____ day of _____ 20__ .

_____
(Secretary)

BID FORM
ATTACHMENT #3

IRANIAN ENERGY DIVESTMENT CERTIFICATION

Pursuant to Section 103-g
Of the New York State
General Municipal Law

A. By submission of this bid/proposal, each bidder/proposer and each person signing on behalf of any bidder/proposer certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the New York State Finance Law.

B. A Bid/Proposal shall not be considered for award, nor shall any award be made where the condition set forth in Paragraph A above has not been complied with; provided, however, that in any case the bidder/proposer cannot make the foregoing certification set forth in Paragraph A above, the bidder/proposer shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore. Where Paragraph A above cannot be complied with, the Purchasing Unit to the political subdivision, public department, agency or official thereof to which the bid/proposal is made, or his designee, may award a bid/proposal, on a case by case business under the following circumstances:

1. The investment activities in Iran were made before April 12, 2012, the investment activities in Iran have not been expanded or renewed after April 12, 2012, and the Bidder/Proposer has adopted, publicized and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or

2. The political subdivision makes a determination that the goods or services are necessary for the political subdivision to perform its functions and that, absent such an exemption, the political subdivision would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

_____
Signature

_____
Title

_____ _____
Date Company

BID FORM
ATTACHMENT #4

CERTIFICATION ON VIOLATIONS

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

   ☐ True ☐ False

   If False is selected, information for questions 2 and 3 must be provided. If True is selected questions 2 and 3 are not applicable, continue to question 4.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

   _____

   _____

   _____

   _____

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

   _____

   _____

   _____

   _____

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

_____ _____
Name Title

Sworn to before me this _____day of _____, 20__.

_____
Notary Public

BID FORM
ATTACHMENT #5

SUBCONTRACTORS LIST

In accordance with New York State law, list below names of each subcontractor for Plumbing, Mechanical and Electrical work whose figures have been used in preparing the Bid, and to whom subcontracts are expected to be awarded, should the Contract be awarded to the Bidder.

Include amount to be paid to each subcontractor.

Any changes to this list will require the approval of the Owner upon a showing of legitimate construction need for the change.

Scope of Subcontractor's Work	**Subcontractor Name**	**Dollar Amount of Subcontract**
Plumbing		
General		
Electrical		

BID FORM ATTACHMENT # 6

NAME OF BIDDER_____

BIDDER'S QUALIFICATIONS FORM

THIS FORM MUST BE NOTARIZED AND SUBMITTED WITH THE BID

All questions must be answered and the data given must be clear and comprehensive. If necessary, questions may be answered on separate attached sheet.

1. Name of Bidder:
2. Permanent main office address:
3. When organized:
4. If a corporation, where incorporated:
5. How many years have you been engaged in the contracting business under your present firm or trade name?
6. Contracts on hand: (List these, showing amount of each contract and the appropriate anticipated dates of completion.)
7. General character of work performed by your company:
8. Have you ever failed to complete any work awarded to you?

   If so, where and why?
9. Have you ever defaulted on a contract?

   If so, where and why?
10. List the more important projects recently completed by your company, stating the approximate cost for each, and the month and year completed.
11. List your major equipment available for this Contract.
12. List your experience in work similar to this project.
13. List the background and experience of the principal members of your organization, including officers.
14. List the work to be performed by Subcontractors and summarize the dollar value of each Subcontract.
15. Credit available: $
16. Give bank reference:

17. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner?

18. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Bidder's Qualifications Form.

Dated _____this _____ date of _____, 20__ .

_____
(Name of Bidder)

By _____

Title _____

State of _____)
) ss.

County of _____

_____ being duly sworn deposes and says that he is _____

_____ of _____

_____
(Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me

this _____ day of_____, 20___

My commission expires _____, 20___

BID FORM ATTACHMENT #7_

Beacon City School District
10 Education Drive
Beacon, NY 12508

INSURANCE CERTIFICATION FORM
THIS FORM MUST BE SUBMITTED WITH THE BID

Project Number: 279180-24002.1 Project Name: Reconstruction to: Beacon CSD

Your Insurance representative must complete the form below in order to be considered for the award of this Bid or Project, and it is important that you complete the Bidder's Acknowledgement section of this form (below).
Please note that a Standard Certificate of Insurance must accompany your Bid submission in order for your Bid to be considered.

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 coverage? Yes _____ No _____

_____ _____
Insurance Representative Date

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 Standard Certificate of Insurance must be submitted with my Bid; and if it is not, the Beacon City School District may reject my Bid and award to the next lowest Bidder.

Firm Name:_____

Address:_____

Date:_____ _____
Bidder's Signature

TETRA TECH
ARCHITECTS & ENGINEERS

10 Brown Rd.
Ithaca, NY 14850
(607) 277-7100

Ithaca, New York
Farmingdale, New York
Albany, New York

BID FROM (Bidder's Name) : _____

(Address) : _____

_____

Bidder's Telephone : _____

Bidder's Facsimile (Fax) : _____

Bidder's E-mail Address (if applicable) : _____

BID FORM
(submit in duplicate)

CONTRACT: **ELECTRICAL WORK EC**

PROJECT TITLE: RECONSTRUCTION AT BEACON HS

DATE: MARCH 28, 2025

PROJECT NO.: 279180-24002.1

BID TO: Beacon City School District
10 Education Drive
Beacon, New York 12508

The Bidder hereby certifies that it has examined and fully understands the requirements and intent of the Bidding Documents, including the Bidding Requirements and proposed Contract Documents; and proposes to furnish all labor, materials, and equipment necessary to complete the Work on, or before, the dates specified in the Contract Documents for the **BASE BID** sum of:

_____
(words)

_____ ($_____)
(figures)

Show all amounts in both words and figures; in the event of a discrepancy between amounts written in words and figures, the amount written in words shall govern.

LIST OF ADDENDA RECEIVED

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

No. _____ Date_____ No. _____ Date _____

BID ATTACHMENTS

Enclosed with this Bid are the following attachments:

Attachment #1 - Non-Collusive Bidding Certification.
Attachment #2 - Certified Corporate Resolution.
Attachment #3 – Iranian Energy Divestment Certification
Attachment #4 – Certification on Violations
Attachment #5 – Subcontractors List
Attachment #6 – Bidder's Qualifications
Attachment #7 – Insurance Certification

BID SECURITY

Enclosed with this Bid is bid security in the amount of five percent of the Base Bid.

PUBLIC WORK CONTRACTOR AND SUBCONTRACTOR REGISTRY

The Bidder hereby certifies that the Bidder and its subcontractors have completed the required New York State Public Work Contractor and Subcontractor Registry in accordance with the New York State Department of Labor (NYSDOL) requirements. **Bidders are required to attach to this bid form proof of registration as required by Labor Law Section 220-i as a minimum qualification and failure to provide proof of registration will disqualify a bidder.**

EXECUTION OF CONTRACT

If written notice of the acceptance of this Bid is transmitted to the undersigned within 45 days following the Bid opening, the undersigned will, within 10 days following the Notice of Award, execute and transmit a Contract in the form as required by the Architect.

This Bid may be withdrawn at any time prior to the Bid opening.

SIGNATURE

( ) NAME OF BIDDER (Corporate Name)
( )
( ) _____
(Corporate Seal)
( ) SIGNATURE (Corporate Officer)
( )
( ) _____
( )
( ) DATE: _____

Federal Employer's Identification Number: _____

BID FORM
ATTACHMENT #1

GENERAL CONDITIONS TO BID
NON-COLLUSIVE BIDDING CERTIFICATION

No bid will be accepted that does not have this form completely executed.

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 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 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;

(d) The person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification, and under the penalties of perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as to the person signing in its behalf;

(e) That attached hereto (if corporate bidder) is a certified copy of resolution authorizing the execution of this certified by the signature of this bid or proposal in behalf of the corporate bidder.

_____
(Individual)

_____
(Corporation)

Dated:_____ By _____
(Signature of Officer)

This Non-Collusive Bidding Certificate must be submitted with the bid.

BID FORM
ATTACHMENT #2

CERTIFIED CORPORATE RESOLUTION

RESOLVED THAT _____ be authorized to sign and submit the bid or proposal of this corporation for the following project:

_____

_____

and to include in such bid or proposal the certificate as to non-collusion required by section one hundred three-d (103-d) of the general municipal law as to the act and deed of such corporation, and for any inaccuracies or mis-statements in such certificate this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution and adopted by

_____ at a meeting of its board of directors held on the

_____ day of _____ 20__ .

_____
(Secretary)

BID FORM
ATTACHMENT #3

IRANIAN ENERGY DIVESTMENT CERTIFICATION

Pursuant to Section 103-g
Of the New York State
General Municipal Law

A. By submission of this bid/proposal, each bidder/proposer and each person signing on behalf of any bidder/proposer certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the New York State Finance Law.

B. A Bid/Proposal shall not be considered for award, nor shall any award be made where the condition set forth in Paragraph A above has not been complied with; provided, however, that in any case the bidder/proposer cannot make the foregoing certification set forth in Paragraph A above, the bidder/proposer shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore. Where Paragraph A above cannot be complied with, the Purchasing Unit to the political subdivision, public department, agency or official thereof to which the bid/proposal is made, or his designee, may award a bid/proposal, on a case by case business under the following circumstances:

1. The investment activities in Iran were made before April 12, 2012, the investment activities in Iran have not been expanded or renewed after April 12, 2012, and the Bidder/Proposer has adopted, publicized and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or

2. The political subdivision makes a determination that the goods or services are necessary for the political subdivision to perform its functions and that, absent such an exemption, the political subdivision would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

_____
Signature

_____
Title

_____ _____
Date Company

BID FORM
ATTACHMENT #4

CERTIFICATION ON VIOLATIONS

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

   ☐ True ☐ False

   If False is selected, information for questions 2 and 3 must be provided. If True is selected questions 2 and 3 are not applicable, continue to question 4.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

   _____

   _____

   _____

   _____

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

   _____

   _____

   _____

   _____

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

_____ _____
Name Title

Sworn to before me this _____day of _____, 20__.

_____
Notary Public

BID FORM
ATTACHMENT #5

SUBCONTRACTORS LIST

In accordance with New York State law, list below names of each subcontractor for Plumbing, Mechanical and Electrical work whose figures have been used in preparing the Bid, and to whom subcontracts are expected to be awarded, should the Contract be awarded to the Bidder.

Include amount to be paid to each subcontractor.

Any changes to this list will require the approval of the Owner upon a showing of legitimate construction need for the change.

Scope of Subcontractor's Work	**Subcontractor Name**	**Dollar Amount of Subcontract**
Plumbing		
General		
Electrical		

BID FORM ATTACHMENT # 6

NAME OF BIDDER_____

BIDDER'S QUALIFICATIONS FORM

THIS FORM MUST BE NOTARIZED AND SUBMITTED WITH THE BID

All questions must be answered and the data given must be clear and comprehensive. If necessary, questions may be answered on separate attached sheet.

1. Name of Bidder:
2. Permanent main office address:
3. When organized:
4. If a corporation, where incorporated:
5. How many years have you been engaged in the contracting business under your present firm or trade name?
6. Contracts on hand: (List these, showing amount of each contract and the appropriate anticipated dates of completion.)
7. General character of work performed by your company:
8. Have you ever failed to complete any work awarded to you?

   If so, where and why?
9. Have you ever defaulted on a contract?

   If so, where and why?
10. List the more important projects recently completed by your company, stating the approximate cost for each, and the month and year completed.
11. List your major equipment available for this Contract.
12. List your experience in work similar to this project.
13. List the background and experience of the principal members of your organization, including officers.
14. List the work to be performed by Subcontractors and summarize the dollar value of each Subcontract.
15. Credit available: $
16. Give bank reference:

17. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner?

18. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Bidder's Qualifications Form.

Dated _____this _____ date of _____, 20__ .

_____
(Name of Bidder)

By _____

Title _____

State of _____)
) ss.

County of _____

_____ being duly sworn deposes and says that he is _____

_____ of _____

_____
(Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me

this _____ day of_____, 20___

My commission expires _____, 20___

BID FORM ATTACHMENT #7_

Beacon City School District
10 Education Drive
Beacon, NY 12508

INSURANCE CERTIFICATION FORM
THIS FORM MUST BE SUBMITTED WITH THE BID

Project Number: 279180-24002.1 Project Name: Reconstruction to: Beacon CSD

Your Insurance representative must complete the form below in order to be considered for the award of this Bid or Project, and it is important that you complete the Bidder's Acknowledgement section of this form (below).
Please note that a Standard Certificate of Insurance must accompany your Bid submission in order for your Bid to be considered.

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 coverage? Yes _____ No _____

_____ _____
Insurance Representative Date

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 Standard Certificate of Insurance must be submitted with my Bid; and if it is not, the Beacon City School District may reject my Bid and award to the next lowest Bidder.

Firm Name:_____

Address:_____

Date:_____ _____
Bidder's Signature

Beacon City School District
10 Education Drive
Beacon, NY 12508

_____ Work Contract act

BOND CERTIFICATION FORM

THIS FORM MUST BE SUBMITTED WITH THE BID

Project Number: 279180-24002.1 Project Name: Reconstruction at Beacon High School

I acknowledge that I have reviewed the Performance Bond and Payment Bond requirements of this Bid and have considered the costs, if any, of procuring the required bonding and will be able to supply the bonds required in accordance with the Bid, if it is awarded.

I understand that this form must be submitted with my Bid; and if it is not, the Beacon City School District may reject my Bid and award to the next lowest Bidder.

Name of Bonding Company:_____

Address of Bonding Company:_____

Bidder's Firm Name:_____

Address:_____

Date:_____

_____
Bidder's Signature

_____
Print Name

NAME OF BIDDER______________________________

PROPOSED PRODUCTS FORM

SUBMITTED BY THREE LOW BIDDERS WITHIN THREE DAYS FOLLOWING BID OPENING

In accordance with Articles 4 and 6 of the Instructions to Bidders, list specified products and corresponding proposed equivalent products below. Include additional pages as necessary.

Attach additional sheet explaining any aspect of the Contract Documents that cannot be complied with by the manufacturer or supplier of the proposed equivalent product.

Specified Product	**Equivalent Product**
Technical Section: ________________	Manufacturer: ____________________________________
Specified Product: ________________	Product Designation: ____________________________________
Technical Section: ________________	Manufacturer: ____________________________________
Specified Product: ________________	Product Designation: ____________________________________
Technical Section: ________________	Manufacturer: ____________________________________
Specified Product: ________________	Product Designation: ____________________________________
Technical Section: ________________	Manufacturer: ____________________________________
Specified Product: ________________	Product Designation: ____________________________________
Technical Section: ________________	Manufacturer: ____________________________________
Specified Product: ________________	Product Designation: ____________________________________
Technical Section: ________________	Manufacturer: ____________________________________
Specified Product: ________________	Product Designation: ____________________________________
Technical Section: ________________	Manufacturer: ____________________________________
Specified Product: ________________	Product Designation: ____________________________________

NAME OF BIDDER_____

PROPOSED SUBCONTRACTORS FORM

SUBMITTED BY THREE LOW BIDDERS
WITHIN THREE DAYS FOLLOWING BID OPENING

Review of proposed subcontractors shall be in accordance with Article 5.2 of the General Conditions.

Instructions:

1. List below name of each subcontractor whose figures have been used in preparing the Bid, and to whom a subcontract is expected to be awarded, upon Architect's review, should the Contract be awarded to the Bidder.

2. For each subcontractor, identify the Specification section(s) included in that subcontract.

Subcontractor Name	**Specification Section**

TAX EXEMPTION

The Owner is exempt from payment of FEDERAL, STATE, LOCAL TAXES, AND SALES AND COMPENSATING USE TAXES of the State of New York and of Cities and Counties on all materials and supplies sold to the Owner pursuant to the provisions of this Contract. These taxes are **not** to be included in bids. This exemption does not, however, apply to tools, machinery, equipment, or other property leased by or to the Contractor or a subcontractor and the Contractor and his subcontractor shall be responsible for and pay any and all applicable taxes, including sales and compensating ue taxes, on such leased tools, machinery, equipment or other property.

PAYROLL RECORDS

In accordance with Section 1, Paragraph a of Subdivision 3-a of Section 220 of the Labor Law, the Contractor shall submit to the Owner within 30 days after issuance of Contractor's first payroll, and every 30 days thereafter, a transcript of the original payroll record, subscribed and affirmed as true under the penalties of perjury.

DRAFT

AIA® Document A232™ – 2019

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

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

Reconstruction to:
Beacon High School SED #13-02-00-01-0-020-013

Tt Project Number 279180-24002.1

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

«UW Marx
20 Gurley Avenue
Troy, New York 12182

THE OWNER:
(Name, legal status, and address)

«Beacon City School District
10 Education Drive
Beacon, New York 12508

THE ARCHITECT:
(Name, legal status, and address)

«Tetra Tech Engineers, Architects & Landscape Architects, P.C.»
«d/b/a Tetra Tech Architects & Engineers»
«Cornell Business & Technology Park»
«10 Brown Road»
«Ithaca, New York 14850»

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

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

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

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

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. The Contract Documents include the Notice to Bidders, Instructions to Bidders, sample forms and the Contractor's bid.

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

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

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

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

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

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

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

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

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

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent

consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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

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

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

§ 1.2.3.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

.1 Modifications, as defined in Section 1.1.1.
.2 The Agreement.
.3 Addenda, with those of later date having precedence over those of earlier date.
.4 The General Conditions of the Contract for Construction.
.5 Division 01 of the Specifications.
.6 Drawings and remaining Divisions of the Specifications.

In the case of conflicts or discrepancies between Drawings and Divisions of the Specifications (other than Division 01), or within or among the Contract Documents and not clarified by Addendum, the Architect will determine which takes precedence in accordance with Sections 4.2.11, 4.2.12, and 4.2.13.

§ 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 Construction Manager and the Architect do 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. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

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

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

§ 2.3.5 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.

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

§ 2.3.7 The Owner shall furnish the Contractor three (3) copies of the Contract Documents, including one set to be used for the Project Record Drawings. The Contractor may purchase additional copies at the cost of reproduction, postage and handling.

§ 2.3.8 The Owner shall endeavor to forward all communications to the Contractor through the Construction Manager and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents.

§ 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, or fails or refuses to provide a sufficient amount of properly supervised and coordinated labor, materials or equipment so as to be able to complete the work within the Contract time, or disregards the instruction of the Architect or Owner when based upon the requirements of the Contract, 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 written notice from the Owner to commence and continue correction of such

default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to review by the Construction Manager and prior approval of the Architect, and the Construction Manager or Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses (including reasonable attorney's fees) and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner 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 Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.2.1 Do not scale Drawings. Follow figure dimensions, confirming on site.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, 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.

§ 3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 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, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive.

§ 3.4.2.1 After the Contract has been executed, the Owner and Architect will consider requests for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 01 of the Specifications). By making requests for substitutions, the Contractor:

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

§ 3.4.2.2 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for reviewing the Contractor's proposed substitutions for convenience after the period noted in Division 01 Section

"Substitution Procedures" and making agreed-upon changes in the Drawings and Specifications resulting from such substitutions.

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

§ 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 or portions thereof provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.6.1 The Owner is exempt from payment of Federal, State, local taxes, and from payment of sales and compensating use taxes of the State of New York and of cities and counties on all materials and supplies sold to the Owner pursuant to the provisions of this Contract. These taxes are not to be included in bids. This exemption does not, however, apply to tools, machinery, equipment, or other property leased by, or to the Contractor or a subcontractor; and the Contractor and its subcontractor shall be responsible for, and pay, any and all applicable taxes, including sales and compensating use taxes, on such leased tools, machinery, equipment or other property.

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

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit from the New York State Education Department. The Contractor shall secure and pay for all other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.1.1 The Owner shall secure the building permit from the New York State Education Department.

§ 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.

§ 3.7.2.1 In accordance New York State Labor Law Article 8, Section 220, subd. 3-a(a), the Contractor shall submit to the Owner within 30 days after issuance of Contractor's first payroll, and every 30 days thereafter, a transcript of the original payroll record, subscribed and affirmed as true under the penalties of perjury.

§ 3.7.2.2 The Contractor shall comply with all applicable New York State Department of Labor requirements, including the provision that every worker employed in performance of a public work contract shall be certified as having completed an OSHA 10-hour safety training course. The Contractor and subcontractor shall be solely responsible for compliance with this requirement with respect to their employees. The Contractor's or subcontractor's failure to comply with this requirement shall not transfer or in any way impose the responsibility for worker safety upon the Owner or the Architect.

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

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

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

§ 3.8 Allowances

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

§ 3.8.2 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** Lump Sum Allowances, Unit Cost Allowances and Quantity Allowances: 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;
- **.3** Contingency Allowances: Contractor's costs, including all such subcontractor costs, for receiving and handling at Project site, labor, installation, and similar costs related to products and materials under allowance shall be included as part of the allowance. Contractor, and subcontractor, Overhead and profit related to the allowance shall be included as part of the Contract Sum and not part of the allowance; and
- **.4** 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.
- **.5** The Architect shall create and process Allowance Access Authorizations for the Construction Manager and Owner's approval and execution in accordance with the Contract Documents.

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

§ 3.8.4 Refer to Division 01 Section "Allowances" for additional information.

§ 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 in writing, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, within 10 business days after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

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

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data, and Samples

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

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

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

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

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

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

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

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

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

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

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

information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

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

§ 3.12.11 The Contractor is required to provide all submittals for the Architect's review; all submittals to be provided to the Architect by the Submittal deadlines noted in the Contract Documents. The Architect's review of Contractor's submittals will be limited to the time preceding the Submittal deadline and will consist of an examination of an initial submittal and **one (1)** resubmittal[s]. The Owner is entitled to obtain reimbursement from the Contractor for amounts paid to the Architect for evaluation of additional resubmittals, and for evaluation of submittals for which the initial submission is received after the Submittal deadlines.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

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

§ 3.13.3 The Contractor shall be responsible for enforcing **the Owner's security and access policies and procedures**, the Owner's Code of Conduct, and the following rules of conduct for its personnel and those of its subcontractors, sub-subcontractors, and suppliers at the Project site , and the Owner's Project Representative shall provide interpretations should a question arise if the rules of conduct are being adequately enforced by the Contractor:

.1 No smoking or use of tobacco products.
.2 No drinking of alcoholic beverages or use of controlled substances.
.3 No working, or presence on site, under the influence of alcoholic beverages or controlled substances.
.4 No use of indecent language or display of indecent images, publications or terms.
.5 No use of radios or other entertainment devices.
.6 No horseplay or dangerous behavior.
.7 No firearms or other weapons.
.8 No communication with staff or students.

§ 3.13.4 The Contractor shall require its personnel and those of its subcontractors, sub-subcontractors and suppliers to wear visible photo-identification badges acceptable to the Owner, at all times for identification and security purposes.

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

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste

materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

§ 4.1 General

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

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

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

§ 4.2 Administration of the Contract

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

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. 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. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

§ 4.2.2.2 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Construction Manager for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

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

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

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

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

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

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents and will notify the Owner and each other about the rejection. The Construction Manager shall determine in general whether the Work of the Contractor is being performed in accordance with the requirements of the Contract Documents and notify the Owner, Contractor and Architect of defects and deficiencies in the Work. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require additional inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to

exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing any of the Work.

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

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

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

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

§ 4.2.13 The Architect will prepare Change Orders, Construction Change Directives and Allowance Change Authorizations.

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

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

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

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

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

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith.

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site or otherwise furnish labor, materials, equipment, or other services with respect to the Work. 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 Separate Contractors or the subcontractors of Separate Contractors.

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

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

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

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager 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, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager 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, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.2.5 The Contractor shall perform at least twenty-five percent (25%) of the cost of the Contract (not including the costs of materials, insurance, bonds, submittals and similar items) with its own employees.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 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 with Own Forces and to Award Other 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. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

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

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

§ 7.1.4 The combined overhead and profit (for Contractor, subcontractors, suppliers, and contractors of a lower-tier) included in the total cost to the Owner for a change in the Work shall be as follows:

.1 Maximum combined overhead and profit, fifteen percent (15%) of the cost.

.2 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.4.

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

§ 7.2 Change Orders

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

.1 The change in the Work;

.2 The amount of the adjustment, if any, in the Contract Sum; and

.3 The extent of the adjustment, if any, in the Contract Time.

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

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

§ 7.3.5 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager 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 Construction Manager 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 Construction Manager and 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;

§ 7.3.6 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.

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

§ 7.3.8 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.

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

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

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

§ 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 Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

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. The date of commencement of the Work shall not be changed by the effective date of such insurance.

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by 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, based on the recommendation of the Construction Manager, 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 The Owner shall not be liable to the Contractor and/or any subcontractor for claims or damages of any nature caused by or arising out of delays. The sole remedy against the Owner for delays shall be the allowance of additional time for completion of the Work, the amount of which shall be subject to the claims procedure set forth herein. Except to the extent, if any, expressly prohibited by law, the Contractor expressly agrees not to make and hereby waives any claim for damages for delay, including, but not limited to, those resulting from increased labor or material costs; directions given or not given by the Owner, Construction Manager or Architect, including scheduling and coordination of the Work; the Architect's preparation of drawings and specifications or review of shop drawings and requests for instruction(s); or, on account of any delay, obstruction or hindrance for any cause whatsoever by the Owner, Construction Manager, Architect, or any other contractor on the project, whether or not foreseeable or anticipated. The Contractor agrees that its sole right and remedy therefor shall be an extension of time, if appropriate. **IT IS EMPHASIZED THAT NO MONETARY RECOVERY MAY BE OBTAINED BY THE CONTRACTOR FOR DELAY AGAINST THE OWNER, CONSTRUCTION MANAGER, OR ARCHITECT BASED ON ANY REASON AND THAT THE CONTRACTOR'S SOLE REMEDY, IF APPROPRIATE, IS ADDITIONAL TIME.**"

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 Construction Manager, 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 Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and

unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien from Subcontractors and suppliers and shall reflect retainage if provided for in the Contract Documents. The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G7032, Application and Certificate for Payment. Alternative payment application forms are not permitted. AIA Document G732 shall be supported by a current authorized edition of AIA Document G703, Continuation Sheet [or equivalent continuation sheet, subject to the approval of Owner and Architect].

§ 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 Construction Manager and 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.

§ 9.3.1.3 Until Substantial Completion, the Owner shall pay 95 percent of the amount due the Contractor on account of progress payments. At Substantial Completion, the Construction Manager and Architect may authorize remaining partial payments to be made in full, less twice the value of items remaining to be completed and an amount necessary to satisfy any outstanding claims, liens, or judgments.

§ 9.3.1.4 "Applications for Payment must be accompanied by any and all releases of liens for previous applications from Contractor and his/her subcontractors and a sworn and notarized statement that all subcontractors have been paid to at least 95% of previously requisitioned sums.

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

Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

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

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

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

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

§ 9.5 Decisions to Withhold Certification

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

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor or other Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

§ 9.6.1 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 Construction Manager and Architect.

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

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

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

§ 9.6.5 The Contractor's payments to material and equipment 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 Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's 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 Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager 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 the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 No later than 14 days prior to the Contract-scheduled date of Substantial Completion, the Contractor shall issue a letter to the Architect and Construction Manager confirming their work is ready for the Substantial Completion inspection. No later than seven days after Contract-scheduled date of Substantial Completion (including authorized adjustments), the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. Absence the contractor letter confirming readiness of work, the Architect may elect to postpone the substantial completion inspection. If the Architect's inspection discloses any item 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 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 the actual date of Substantial Completion.

§ 9.8.2.1 The Architect will perform no more than one inspection to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections.

§ 9.8.3 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.

§ 9.8.4 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. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

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

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

§ 9.10 Final Completion and Final Payment

§ 9.10.1 On or within seven (7) days following the date of Final Completion (as established in the bid documents or modified by Change Order) the Architect will conduct a final inspection of the work. As a result of that inspection, the Architect will issue a Final Inspection Report. This report will document the condition of the work and will

render a formal opinion as to the whether or not the work or designated portion is complete. If, as a result of the Architect's inspection, it is determined that the work is not complete and in accordance with the Contract Documents, the Architect shall notify the Owner and Contractor in writing of this opinion. This notice will include the Final Inspection Report documenting the conditions of the work and will be considered a formal notice to the Contractor of their failure to fulfill the terms and conditions of their contract.

If as a result of this inspection, it is determined that the work is complete, the Contractor shall submit their Final Payment Application and Certificate for Payment. The Architect will then certify and issue the final Certificate for Payment stating that to the best of the Architects knowledge, information and belief, and on the basis of the Architect's periodic site visits and inspections, the Work has been completed in accordance with the terms and conditions of 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 the conditions listed in section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. The final Certificate for Payment will not be issued until all work on the final inspection report is completed or corrected.

§ 9.10.1.1 The Architect will perform no more than one on-site observation to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional on-site observations.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5) 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 Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment 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.

§ 9.10.6 If the Contractor is responsible for delays in the final completion and closeout beyond the contract specified time, the Owner is entitled to reimbursement from the Contractor for amounts paid by the Owner to subsequently extend the Electronic Submittal System (Submittal Exchange).

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. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Contractor shall be responsible for maintaining safety data sheets at the site.

The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

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

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and
- **.4** construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.2 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, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials

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

§ 10.3.2 Upon receipt of the Contractor's written 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, Construction Manager 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, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager 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, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), 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, Construction Manager and Construction Manager's consultants, and the 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. The policy certificate must include the project name.

§ 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 directly to the Owner, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner 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 both the Contractor and the Construction Manager, separately and 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 directly to the Contractor, and separately to the Construction Manager, 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 Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor, Architect, and Construction Manager for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum 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 Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 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 written 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, Construction Manager 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, Separate Contractors, or other Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be affected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is. Any lawsuits arising from disputes under the contract and related to this Project shall be brought in the Supreme Court of New York, Dutchess County, or the United States District Court, Southern District of New York, if applicable.

§ 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, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. 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 Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall 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.

§ 13.6 Time Limits on Claims

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law.

§ 13.7 Equal Opportunity

§ 13.7.1 The Contractor shall maintain policies of employment as follows:

.1 The Contractor and the Contractor's subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, or natural 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, notice setting forth the policies of non-discrimination.

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

§ 13.8 Wage Rates

§ 13.8.1 The Contractor shall comply with Prevailing Wage Rates issued and periodically updated, by the New York State Department of Labor, for the location and duration of the Project.

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, under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.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,

under direct or indirect contract with the Contractor, 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, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 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 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, Construction Manager and 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 breaches a material provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, after consultation with the Construction Manager, 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' written 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 Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 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 the 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 this 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 written 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 Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Written notice shall contain a heading stating "Notice of Claim" to clearly identify it as such. Such notice shall set forth in detail the circumstances that form the basis for the Claim and shall include the following:

.1 Clear statement of claim matter, including background and chronology.

.2 Documentation in support of claim matter.

.3 Documentation in support of claimed damages.

.4 Certification by responsible officer of claimant.

§ 15.1.3.3 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. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 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, written 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. 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.

§ 15.1.6.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

§ 15.1.6.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

§ 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.

§ 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 arising prior to the date of final payment is due. 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, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties 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 of 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

§ 15.3.2 The parties may 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.

§ 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.

INSURANCE REQUIREMENTS – CAPITAL CONSTRUCTION – Beacon City SD

1. Notwithstanding any terms, conditions or provisions, in any other writing between the parties, the contractor hereby agrees to effectuate the naming of the District as an Additional Insured on the contractor's insurance policies, except for workers' compensation and N.Y. State Disability insurance.

2. The policy naming the District as an Additional Insured shall:

   a. Be an insurance policy from an A.M. Best A- rated or better insurer, licensed to conduct business in New York State. A New York licensed and admitted insurer is strongly preferred. The decision to accept non-licensed and non-admitted carriers lies exclusively with the District and may create significant vulnerability and costs for the District.

   b. State that the organization's coverage shall be primary and non-contributory coverage for the District, its Board, employees and volunteers with a waiver of subrogation in favor of the District.

   c. Additional insured status shall be provided by standard or other endorsements that extend coverage to the District for on-going operations (CG 20 38) and products and completed operations (CG 20 37). The decision to accept an endorsement rests solely with the District. A completed copy of the endorsements must be attached to the Certificate of Insurance.

3. a. The certificate of insurance must describe the services provided by the contractor (e.g., roofing, carpentry or plumbing) that are covered by the liability policies.

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

   c. There will be no coverage restrictions and/or exclusions involving New York State Labor Law statutes or gravity related injuries.

   d. A fully completed New York Construction Certificate of Liability Insurance Addendum (ACORD 855 2014/15) must be included with the certificates of insurance. Policy exclusions may not be accepted.

4. The contractor agrees to indemnify the District for applicable deductibles and self-insured retentions.

5. Minimum Required Insurance:

   a. **Commercial General Liability Insurance**
   $1,000,000 per Occurrence/$2,000,000 Aggregate
   $2,000,000 Products and Completed Operations
   $1,000,000 Personal and Advertising Injury
   $100,000 Fire Damage
   $10,000 Medical Expense

The general aggregate shall apply on a per-project basis.

b. **Owners Contractors Protective (OCP) Insurance**
For projects less than or equal to $1,000,000 and work on 1 story (10 feet) only; $1 million per occurrence, $2 million aggregate with the District as the Named Insured.

For projects greater than $1,000,000 and/or work over 1 story (10 feet); $2 million per occurrence, $4 million aggregate with the District as the Named Insured.

For all projects where General Liability, Auto and Umbrella/Excess Coverage is with non-licensed and non-admitted carriers in New York State; $2 million per occurrence, $4 million aggregate with the District as the named Insured.

The District will be the Named Insured on OCP Policies. There will be no Additional Insureds on any OCP Policies.

c. **Automobile Liability**
$1,000,000 combined single limit for owned, hired, borrowed and non-owned motor vehicles.

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

e. **Builder's Risk**
Must be purchased by the contractor to include interest of the Owner and Contractor jointly in a form satisfactory to the owner. The limit must reflect the total completed value – all material and labor costs and provide coverage for fire, lightning, explosion, extended coverage, vandalism, malicious mischief, windstorm, hail and/or flood.

f. **Umbrella/Excess Insurance**
$5 million each Occurrence and Aggregate for general construction and no work at elevation (1 story – 10 feet) or project values less than or equal to $1,000,000.

$10 million each Occurrence and Aggregate for high-risk construction, work at elevation (>1 story or 10 feet) or project values greater than $1,000,000.

Umbrella/Excess coverage shall be on a follow-form basis over the Auto Liability and General Liability coverages.

6. Contractor acknowledges that failure to obtain such insurance on behalf of the District constitutes a material breach of contract and subjects it to liability for damages, indemnification and all other legal remedies available to the District/BOCES. The contractor is to provide the District/BOCES with a certificate of insurance, evidencing the above requirements have been met, prior to the commencement of work.

7. **Subcontractors are subject to the same terms and conditions as stated above and must submit same to the District for approval prior to the start of any work.**

8. In the event the General Contractor fails to obtain the required certificates of insurance from the Subcontractor and a claim is made or suffered, the Contractor shall indemnify, defend, and hold harmless the District, its Board, employees and volunteers from any and all claims for which the required insurance would have provided coverage**. This indemnity obligation is in addition to any other indemnity obligation provided in the Contract.**

ADDITIONAL REQUIREMENTS ASBESTOS, LEAD ABATEMENT AND/OR HAZARDOUS MATERIALS

Asbestos/Lead Abatement/Pollution Liability Insurance
$2,000,000 per occurrence/$2,000,000 aggregate, including products and completed operations. Such insurance shall include coverage for the Contractor's operations including, but not limited to, removal, replacement, enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with any related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs. If a retroactive date is used, it shall pre-date the inception of the Contract.

If the Contractor is using motor vehicles for transporting hazardous materials, the Contractor shall maintain pollution liability broadened coverage (ISO Endorsement CA 9948), as well as proof of MCS 90. Coverage shall fulfill all requirements of these specifications and shall extend for a period of three (3) years following acceptance by the District of the Certificate of Completion.

Testing Company Errors and Omission Insurance
$1,000,000 per occurrence/$2,000,000 aggregate for the testing and other professional acts of the Contractor performed under the Contract with the District.

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Beacon City School District

Laurie Gillings
Tetra Tech AE
500 Bi-County Boulevard
Farmingdale NY 11735

Schedule Year	2024 through 2025
Date Requested	01/10/2025
PRC#	2025000346

Location	Beacon High School
Project ID#	279180-24002.1
Project Type	High School Chiller

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

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

The schedule is effective from July 2024 through June 2025. 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

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission: a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion online.

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule form the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12226; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.ny.gov.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.ny.gov.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website www.labor.ny.gov.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. As per Article 6 of the Labor law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemperaneous, true, and accurate payroll records. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment.Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed $100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds $25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "Public Work Project" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers. compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers. Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12226 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of $50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Beacon City School District

Laurie Gillings
Tetra Tech AE
500 Bi-County Boulevard
Farmingdale NY 11735

Schedule Year 2024 through 2025
Date Requested 01/10/2025
PRC# 2025000346

Location Beacon High School
Project ID# 279180-24002.1
Project Type High School Chiller

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, 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.

Contractor Information
All information must be supplied

Federal Employer Identification Number: _____

Name: _____

Address: _____

_____

City: _____ State: _____ Zip: _____

Amount of Contract: $_____

Approximate Starting Date: ____/____/____

Approximate Completion Date: ____/____/____

Contract Type:
[ ] (01) General Construction
[ ] (02) Heating/Ventilation
[ ] (03) Electrical
[ ] (04) Plumbing
[ ] (05) Other : _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to $1,500 for a first offense and up to $5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, https://dol.ny.gov/public-work-and-prevailing-wage
If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.ny.gov .

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website *www.labor.ny.gov* or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

(12.20)

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

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1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12226

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.

NEW YORK STATE OF OPPORTUNITY. Department of Labor

Required Notice under Article 25-B of the Labor Law

Attention All Employees, Contractors and Subcontractors: You are Covered by the Construction Industry Fair Play Act

The law says that you are an employee unless:

- You are free from direction and control in performing your job, **and**
- You perform work that is not part of the usual work done by the business that hired you, **and**
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor**, you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.**

Penalties for paying workers off the books or improperly treating employees as independent contractors:

- **Civil Penalty** — First offense: Up to $2,500 per employee

  Subsequent offense(s): Up to $5,000 per employee

- **Criminal Penalty** — First offense: Misdemeanor - up to 30 days in jail, up to a $25,000 fine and debarment from performing public work for up to one year.

  Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a $50,000 fine and debarment from performing public work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to dol.misclassified@labor.ny.gov. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name:

IA 999 (09/16)

WE ARE YOUR DOL

NEW YORK STATE Department of Labor

New York State Department of Labor
Bureau of Public Work

Attention Employees

THIS IS A:

PUBLIC WORK PROJECT

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at: https://dol.ny.gov/bureau-public-work

If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5287		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is $250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training “prior to the performing any work on the project.”

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.)*
- Training roster, attendance record of other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

WICKS

Public work projects are subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work, when the total project's threshold is $3 million in Bronx, Kings, New York, Queens and, Richmond counties; $1.5 million in Nassau, Suffolk and Westchester counties; and $500,000 in all other counties.

For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or the use of a Project Labor Agreement (PLA), and must be open to public inspection.

Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.

The Commissioner of Labor shall have the power to enforce separate specification requirement s on projects, and may issue stop-bid orders against public owners for non-compliance.

Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.

Contractors must pay subcontractors within a 7 days period.

(07.19)

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.

Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.

Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.

Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

Payrolls and Payroll Records

Contractors and subcontractors are required to establish, maintain, and preserve for not less that six (6) years, contemporaneous, true, and accurate payroll records.

Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury.

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. However, the specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year. All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4
Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3
Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Roofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12226

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Dutchess County General Construction

Boilermaker — 01/01/2025

JOB DESCRIPTION Boilermaker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2024	01/01/2025
Boilermaker	$ 67.38	$ 68.88
Repairs & Renovations	67.38	68.88

Repairs & Renovation: Includes Repairing, Renovating replacement of parts to an existing unit(s).

SUPPLEMENTAL BENEFITS
Per Hour:

Boilermaker Repair & Renovations	33.5% of hourly Wage Paid + $ 26.85	33.5% of Hourly Wage Paid + $26.85

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay.

Repairs & Renovation Includes replacement of parts and repairs & renovation of existing unit.

OVERTIME PAY
See (*B, O, **U) on OVERTIME PAGE
Note:* Includes 9th & 10th hours, double for 11th or more.
** Labor Day ONLY, if worked.

Repairs & Renovation see (B,E,Q) on OT Page

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 12, 15, 25, 26, 29) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:
(1/2) Year Terms at the following percentage of Boilermaker's Wage

1st	2nd	3rd	4th	5th	6th	7th
65%	70%	75%	80%	85%	90%	95%

Supplemental Benefits Per Hour:

	33.5% of Hourly Wage Paid Plus Amount Below	33.5% of Hourly Wage Paid Plus Amount Below
1st Term	$ 20.36	$ 20.36
2nd Term	21.28	21.28
3rd Term	22.22	22.22
4th Term	23.12	23.12
5th Term	24.07	24.07
6th Term	25.00	25.00
7th Term	25.93	25.93

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

4-5

Carpenter — 01/01/2025

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange

WAGES
Per hour: 07/01/2024

Building:
Millwright $ 46.35
+ 8.44*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman $ 34.94

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE
Paid: See (5,6,11,13,16,18,19,25) for 1st & 2nd yr. Apprentices
Overtime: See (5,6,11,13,16,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms:

1st	2nd	3rd	4th
$ 28.18	$ 30.51	$ 34.84	$ 43.50
+ 4.40*	+ 5.19*	+ 5.94*	+ 7.44*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 23.00	$ 24.79	$ 26.90	$ 29.63

8-740.2

Carpenter 01/01/2025

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Orange: : The territory west demarcated by a line drawn from the Bear Mountain Bridge continuing east to the Bear Mountain Circle. The territory south demarcated by a line continuing north on 9W to the town of Cornwall where County Road 107 (also known as Quaker Rd) crosses under 9W to the centerline of Route 32, The territories south and east heading north on Route 32 to Orrs Mills Rd, then west on Orrs Mills Rd to Route 94, continue west and south on Route 94 to the Town of Chester, to the intersection of Kings Highway, continue south on Kings Highway to Bellvale Rd, west on Bellvale Rd to Bellvale Lakes Rd, then south on Bellvale Lakes Rd to Kain Rd, southeast on Kain Rd to Route 17A, then north and southeast along Route 17A to Route 210, then follow Route 210 to NJ Border.

WAGES
Per hour: 07/01/2024

Carpet/Resilient
Floor Coverer $ 34.45
+ 3.25*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

INCLUDES HANDLING & INSTALLATION OF ARTIFICIAL TURF AND SIMILAR TURF INDOORS/OUTDOORS.

SUPPLEMENTAL BENEFITS
Per hour:
$ 28.33

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE
Paid for 1st & 2nd yr.
Apprentices: See (5, 6, 11, 13, 16, 18, 19, 25)
Overtime: See (5, 6, 11, 13, 16, 18, 19, 25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wage per hour - (1) year terms:

1st	2nd	3rd	4th
$15.75	$18.87	$23.55	$28.23
+ 2.48*	+ 2.48*	+ 2.48*	+ 2.48*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits per hour - All apprentice terms:

$ 20.87

8-2287D&O

Carpenter — 01/01/2025

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour: 07/01/2024

Marine Construction:

Marine Diver	$ 75.46
	+ 10.00*
Marine Tender	$ 55.00
	+ 10.00*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 45.65

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 13, 16, 18, 19, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms.

1st year	$ 26.98
	+ 5.50*
2nd year	32.58
	+ 5.50*
3rd year	40.96
	+ 5.50*
4th year	49.35
	+ 5.50*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits
Per Hour:

All terms	$ 32.20

8-1456MC

Carpenter - Building / Heavy&Highway — 01/01/2025

JOB DESCRIPTION Carpenter - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Columbia, Dutchess, Orange, Sullivan, Ulster

WAGES
WAGES (per hour)

Applies to Carpenter (Building/Heavy & Highway/Tunnel), Dockbuilder, Piledriver, Dive Tender, and Diver (Dry):

	07/01/2024	07/01/2025 Additional	07/01/2026 Additional
Base Wage	$ 37.19 + 6.31*	$ 2.23**	$ 2.30**

Applies to Diver (Wet):

Base Wage	$ 50.00 + 6.31*

*For all hours paid straight or premium.
**To be allocated at a later date.

SHIFT WORK
SHIFT DIFFERENTIAL: When mandated by a Government Agency irregular or off shift can be worked. The Carpenter shall receive an additional fifteen percent (15%) of the base wage.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 30.65

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
BUILDING:
Paid: See (1) on HOLIDAY PAGE.
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE.
- Holidays that fall on Sunday will be observed Monday.

HEAVY&HIGHWAY/TUNNEL:
Paid: See (5, 6, 25) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
- Holidays that fall on Sunday will be observed Monday
- Must be employed during the five (5) work days immediately preceding a holiday or during the five (5) work days following the paid holiday to receive holiday pay
- If Employee is entitled to a paid holiday, the Employee is paid the Holiday wage and supplemental benefits whether they work or not. If Employee works the Holiday, the Employee will receive holiday pay (including supplemental benefits), plus the applicable premium wage for working the Holiday. If Employee works in excess of 8 hours on Holiday, then benefits will be paid for any hours in excess of 8 hours.

REGISTERED APPRENTICES
1 Year terms at the following wage rates.

1st	2nd	3rd	4th
$ 18.60 +3.09*	$ 22.31 +3.09*	$ 26.03 +3.09*	$ 29.75 +3.09*

*For all hours paid straight or premium

SUPPLEMENTAL BENEFITS per hour:

All Terms	$ 16.30

11-279.2B/H&H

Electrician — 01/01/2025

JOB DESCRIPTION Electrician **DISTRICT** 11

ENTIRE COUNTIES
Orange, Putnam, Rockland

PARTIAL COUNTIES
Dutchess: Towns of Fishkill, East Fishkill, and Beacon.

WAGES
Per hour:

	07/01/2024
Electrician Wireman/Technician	$ 50.50

+ 9.50*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (subject to overtime premiums):
- On jobs where employees are required to work from boatswain chairs, swinging scaffolds, etc., forty (40) feet or more above the ground, or under compressed air, using Scottair packs, or gas masks, they shall receive an additional $2.00 per hour above the regular straight time rate.
- Journeyman Wireman working in Shafts, Tunnels or on Barges: $5.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman when performing welding or cable splicing: $3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a NYS Asbestos Certificate: $3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a CDL: $3.00 above the Journeyman Wireman rate of pay.

SHIFT WORK

SHIFT DIFFERENTIAL: On Public Work in New York State when shift work is mandated either in the job specifications or by the contracting agency, the following rates apply when shift is worked:

Between 4:30pm & 12:30am	$ 59.30
	+ 9.50*
Between 12:30am & 8:30am	$66.35
	+ 9.50*

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2024
Journeyman	$ 29.68 plus
	3% of straight
	or premium wage

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 15, 16, 25) on HOLIDAY PAGE

When the holiday falls on a Saturday it is observed the Friday before. When the holiday falls on a Sunday it is observed on the Monday after.

REGISTERED APPRENTICES

WAGES:
(1)year terms at the following rates

07/01/2024	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 16.01	$ 19.40	$ 24.25	$ 29.10	$ 33.95	$ 36.38
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
2nd Shift	18.78	22.76	28.45	34.13	39.82	42.67
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
3rd Shift	21.04	25.49	31.86	38.24	44.61	47.80
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*

09/01/2024	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 16.01	$ 19.40	$ 24.25	$ 29.10	$ 33.95	$ 36.38
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
2nd Shift	18.78	22.76	28.45	34.13	39.82	42.67
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
3rd Shift	21.04	25.49	31.86	38.24	44.61	47.80
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*

04/01/2025	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 16.34	$ 19.80	$ 24.75	$ 29.70	$ 34.65	$ 37.13
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
2nd Shift	19.17	23.23	29.03	34.84	40.64	43.55
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
3rd Shift	21.47	26.02	32.52	39.03	45.53	48.79
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

SUPPLEMENTAL BENEFITS per hour:

07/01/2024

1st term	$ 16.28 plus 3% of straight or premium wage
2nd term	$ 16.28 plus 3% of straight or premium wage

3rd term	$ 18.28 plus 3% of straight or premium wage
4th term	$ 18.78 plus 3% of straight or premium wage
5th term	$ 20.28 plus 3% of straight or premium wage
6th term	$ 20.28 plus 3% of straight or premium wage

09/01/2024

1st term	$ 16.28 plus 3% of straight or premium wage
2nd term	$ 17.78 plus 3% of straight or premium wage
3rd term	$ 18.78 plus 3% of straight or premium wage
4th term	$ 19.78 plus 3% of straight or premium wage
5th term	$ 21.28 plus 3% of straight or premium wage
6th term	$ 21.28 plus 3% of straight or premium wage

11-363/1

Electrician 01/01/2025

JOB DESCRIPTION Electrician **DISTRICT** 11

ENTIRE COUNTIES
Sullivan, Ulster

PARTIAL COUNTIES
Delaware: Only in the Townships of Andes, Harpersfield, Kortwright,Stamford, Bovina, Roxbury, Middletown and those portions of Colchester and Hancock south of the East Branch of the Delaware River.
Dutchess: All of the county except for the towns of Fishkill,East Fishkill, and Beacon.
Greene: That portion of the county south of a line following the south limits of the city of Catskill in a Westerly direction from the Hudson River to Highway 23A along 23A to the road following the Little Westkill and continuing along this road to Delaware County.

WAGES

Per hour:	
Electrician Wireman/ Technician	07/01/2024
Electrical/Technician Projects	
under $ 250,000.00	$ 46.50 + 9.50*
over $ 250,000.00	$ 50.50 + 9.50*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (subject to overtime premiums):
- On jobs where employees are required to work from boatswain chairs, swinging scaffolds, etc., forty (40) feet or more above the ground, or under compressed air, using Scottair packs, or gas masks, they shall receive an additional $2.00 per hour above the regular straight time rate.
- Journeyman Wireman working in Shafts, Tunnels or on Barges: $5.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman when performing welding or cable splicing: $3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a NYS Asbestos Certificate: $3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a CDL: $3.00 above the Journeyman Wireman rate of pay.

SHIFT WORK
SHIFT DIFFERENTIAL: On Public Work in New York State when shift work is mandated either in the job specifications or by the contracting agency, the following rates apply:

Shift worked between 4:30pm & 12:30am	
Electrical/Technician Projects	
under $ 250,000.00	$ 54.56 + 9.50*
over $ 250,000.00	$ 59.30 + 9.50*

Shift worked between 12:30am & 8:30am	
Electrical/Technician Projects	
under $ 250,000.00	$ 61.12 + 9.50*
over $ 250,000.00	$ 66.35 + 9.50*

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2024
Journeyman	$ 29.68 plus 3% of straight or premium wage

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 15, 16, 25) on HOLIDAY PAGE
When the holiday falls on a Saturday it is observed the Friday before. When the holiday falls on a Sunday it is observed on the Monday after.

REGISTERED APPRENTICES
WAGES:
(1)year terms at the following rates

07/01/2024	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 16.01	$ 19.40	$ 24.25	$ 29.10	$ 33.95	$ 36.38
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
2nd Shift	18.78	22.76	28.45	34.13	39.82	42.67
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
3rd Shift	21.04	25.49	31.86	38.24	44.61	47.80
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*

09/01/2024	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 16.01	$ 19.40	$ 24.25	$ 29.10	$ 33.95	$ 36.38
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
2nd Shift	18.78	22.76	28.45	34.13	39.82	42.67
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
3rd Shift	21.04	25.49	31.86	38.24	44.61	47.80
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*

04/01/2025	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 16.34	$ 19.80	$ 24.75	$ 29.70	$ 34.65	$ 37.13
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
2nd Shift	19.17	23.23	29.03	34.84	40.64	43.55
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
3rd Shift	21.47	26.02	32.52	39.03	45.53	48.79
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

SUPPLEMENTAL BENEFITS per hour:

07/01/2024

1st term	$ 16.28 plus 3% of straight or premium wage
2nd term	$ 16.28 plus 3% of straight or premium wage
3rd term	$ 18.28 plus 3% of straight or premium wage
4th term	$ 18.78 plus 3% of straight or premium wage
5th term	$ 20.28 plus 3% of straight or premium wage
6th term	$ 20.28 plus 3% of straight or premium wage

09/01/2024

1st term	$ 16.28 plus 3% of straight or premium wage
2nd term	$ 17.78 plus 3% of straight or premium wage
3rd term	$ 18.78 plus 3% of straight or premium wage
4th term	$ 19.78 plus 3% of straight or premium wage
5th term	$ 21.28 plus 3% of straight or premium wage
6th term	$ 21.28 plus 3% of straight or premium wage

11-363/2

Elevator Constructor — 01/01/2025

JOB DESCRIPTION Elevator Constructor **DISTRICT** 1

ENTIRE COUNTIES
Columbia, Dutchess, Greene, Orange, Putnam, Sullivan, Ulster

PARTIAL COUNTIES
Delaware: Towns of Andes, Bovina, Colchester, Davenport, Delhi, Harpersfield, Hemdon, Kortright, Meredith, Middletown, Roxbury, Hancock & Stamford
Rockland: Only the Township of Stony Point.
Westchester: Only the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES

Per Hour	07/01/2024	01/01/2025
Mechanic	$ 70.15	$ 73.07
Helper	70% of Mechanic Wage Rate	70% of Mechanic Wage Rate

SUPPLEMENTAL BENEFITS

Per hour

	07/01/2024	01/01/2025
Journeyworker/Helper	$ 37.885*	$ 38.435*

(*)Plus 6% of regular hourly if less than 5 years of service. Plus 8% of regular hourly rate if more than 5 years of service.

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 15, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE
Note: When a paid holiday falls on Saturday, it shall be observed on Friday. When a paid holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES
Wages per hour:

0-6 mo*	6-12 mo	2nd yr	3rd yr	4th yr
50 %	55 %	65 %	70 %	80 %

(*)Plus 6% of the hourly rate, no additional supplemental benefits.

Supplemental Benefits per hour worked:

Same as Journeyperson/Helper

1-138

Glazier — 01/01/2025

JOB DESCRIPTION Glazier **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES
Per hour:

	07/01/2024	05/01/2025 Additional
Glazier, Glass Tinting and Window Film	$ 63.28	$ 1.11***
Scaffolding, including swing scaffold	67.28	
*Mechanical Equipment	64.28	
**Repair & Maintenance	30.76	

*Mechanical equipment, scissor jacks, man lifts, booms & buckets 30' or more, but not pipe scaffolding.
**Repair & Maintenance- All repair & maintenance work on a particular building whenever performed, where the total cumulative Repair & Maintenance contract value is under $193,000.

***To be allocated at a later date.

SUPPLEMENTAL BENEFITS

Per hour:	7/01/2024
Glazier, Glass Tinting Window Film, Scaffolding and Mechanical Equipment	$ 42.13
Repair & Maintenance	24.62

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE

For 'Repair & Maintenance' see (B, B2, I, S) on overtime page.

HOLIDAY
Paid: See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE
For 'Repair & Maintenance'
Paid: See(5, 6, 16, 25)
Overtime: See(5, 6, 16, 25)

REGISTERED APPRENTICES
Wage per hour:
(1) year terms at the following wage rates:

	7/01/2024
1st term	$ 22.34
2nd term	30.64
3rd term	40.87
4th term	50.14

Supplemental Benefits:
(Per hour)

1st term	$ 19.27
2nd term	27.34
3rd term	32.85
4th term	36.01

8-1087 (DC9 NYC)

Insulator - Heat & Frost — 01/01/2025

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Westchester

WAGES
Per hour:

	07/01/2024
Insulator	$ 60.85
Discomfort & Additional Training**	63.92
Fire Stop Work*	32.97

* Applies on all exclusive Fire Stop Work (When contract is for Fire Stop work only). No apprentices on these contracts only.

**Applies to work requiring; garb or equipment worn against the body not customarily worn by insulators; psychological evaluation ;special training, including but not limited to "Yellow Badge" radiation training

Note: Additional $0.50 per hour for work 30 feet or more above floor or ground level.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 38.25
Discomfort & Additional Training	40.32
Fire Stop Work:	
Journeyworker	19.48

OVERTIME PAY
See (B, E, E2, Q, *T) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Note: Last working day preceding Christmas and New Years day, workers shall work no later than 12:00 noon and shall receive 8 hrs pay.

Overtime: See (2*, 4, 6, 16, 25) on HOLIDAY PAGE.
*Note: Labor Day triple time if worked.

REGISTERED APPRENTICES
(1) year terms:

Insulator Apprentices:

1st	2nd	3rd	4th
$ 32.97	$ 38.54	$ 44.12	$ 49.70

Discomfort & Additional Training Apprentices:

1st	2nd	3rd	4th
$ 34.51	$ 40.38	$ 46.27	$ 52.16

Supplemental Benefits paid per hour:

Insulator Apprentices:

1st term	$ 19.48
2nd term	23.23
3rd term	26.98
4th term	30.74

Discomfort & Additional Training Apprentices:

1st term	$ 20.50
2nd term	24.47
3rd term	28.43
4th term	32.39

8-91

Ironworker 01/01/2025

JOB DESCRIPTION Ironworker **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster

WAGES
Per hour:

	07/01/2024	07/01/2025 Additional	07/01/2026 Additional
Structural	$ 51.38	$ 2.00*	$2.00*
Reinforcing	51.38	2.00*	2.00*
Ornamental	51.38	2.00*	2.00*
Chain Link Fence	51.38	2.00*	2.00*

* To be allocated at a later date.

NOTE: For Reinforcing classification ONLY, Ironworker 4-46Reinf rates apply in Rockland County's southern section (south of Convent Road and east of Blue Hills Road).

SHIFT WORK
On Government Mandated Irregular Workdays or Shift Work, the following wage will be paid:

1st Shift	$ 51.38
2nd Shift	66.39
3rd Shift	71.39

Note- Any shift that works past 12:00 midnight shall receive the 3rd shift differential.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 45.56

OVERTIME PAY
See (B1, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16) on HOLIDAY PAGE
If a holiday falls on Saturday, it will be observed Friday. If a holiday falls on Sunday, it will be observed Monday.

REGISTERED APPRENTICES
Wages:

(1) year terms at the following wage:

	1st yr	2nd yr	3rd yr	4th yr
1st Shift	$ 25.69	$ 30.83	$ 35.97	$ 41.10
2nd Shift	36.15	42.20	48.25	54.29

3rd Shift	39.64	45.99	52.35	58.69

Supplemental Benefits per hour:

	07/01/2024
1st year	$ 40.94
2nd year	41.86
3rd year	42.79
4th year	43.71

11-417

Laborer - Building — 01/01/2025

JOB DESCRIPTION Laborer - Building **DISTRICT** 11

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Columbia: Only the Townships of Greenport, Claverack, Philmont,Clermont, Germantown, Livingston, Hillsdale, Gallatin, Copake, Ancram, Taghkanic and the City of Hudson.

WAGES
ALL WORK RELATED WITH TOXIC OR ANY ASBESTOS OR HAZARDOUS MATERIAL

WAGES: (per hour)

	07/01/2024	06/01/2025 Additional	06/01/2026 Additional
Class 4	$ 49.00	$ 2.90*	$ 3.00*

*To be allocated at a later date.

These rates will cover all work within five feet of the building foundation line.

SHIFT WORK
Shift Differential: On all Governmental mandated irregular or off shift work, an additional 25% of wage is required. The 25% shift differential will be paid on public works contract for shifts or irregular workdays outside the normal working hours for 2nd and 3rd shifts or irregular workday or when mandated or required by state, federal, county, local or other governmental agency contracts.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 33.50
Shift	$ 40.84

OVERTIME PAY
See (B, *E, E5, **Q) on OVERTIME PAGE
*For first 8 hours on Saturday
**When an employee is required to work on a holiday which falls on a Sunday the employee shall be paid three (3) times the hourly rate and one (1) hour benefits for every hour worked. When an employee is required to work on a holiday which falls on a Saturday the employee shall be paid two and a half (2.5) times the hourly rate and one hour benefits for every hour worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE
Holidays that fall on Saturday shall be observed on Friday, when holidays fall on Sunday they shall be observed on Monday.

REGISTERED APPRENTICES
(1000) hour terms at the following wages.

	07/01/2024
1st term	$ 28.05
2nd term	32.35
3rd term	36.70
4th term	41.00

Supplemental Benefits per hour:

All Terms Regular	$ 29.23
All Terms Shift Rate	35.39

11-17tox B

Laborer - Building — 01/01/2025

JOB DESCRIPTION Laborer - Building **DISTRICT** 8

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Columbia: Only the Townships of Ancram, Claverack, Clermont, Copake, Gallatin, Germantown, Greenport, Hillsdale, Hudson, Livingston, Philmont and Taconic.

WAGES
GROUP # 1:
All Laborers except those listed in Group 2

GROUP # 2:
Blaster, Laser Beam Oper., Asphalt Rakers, & Drilling Equipment Only Where a Separate Air Compressor Unit Supplies Power

WAGES per hour:	07/01/2024	06/01/2025 Additional
GROUP # 1	$ 40.00*	$ 2.00**
GROUP # 2	42.35*	

*Subtract $ 4.50 to calculate overtime premium
** To be allocated at a later date

Note: Any job requiring Hazwopper Certification will pay $1.00 above job classification wage rate.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 30.60

OVERTIME PAY
See (B, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: Whenever a holidays falls on Sunday, it will be observed on the following Monday.

REGISTERED APPRENTICES
Wages per hour: 07/01/2024

1000 Hour terms

1st term	$ 28.08
2nd term	31.90
3rd term	35.72
4th term	39.54

Note: Any job requiring Hazwopper Certification will pay $1.00 above job classification wage rate.

Supplemental Benefits per hour:

All terms	$ 23.60

8-235

Laborer - Heavy&Highway **01/01/2025**

JOB DESCRIPTION Laborer - Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Columbia: Only the Townships of Ancram, Claverack, Clermont, Copake,Gallatin, Germantown, Greenport, Hillsdale, Hudson, Livingston, Philmont and Taconic.

WAGES
GROUP I: Blaster, Asphalt Screedman, ACI Certified Flatwork Finisher, Pipe Jacking and Boring Operations, Operator Qualified Dead Condition Pipe Fuser (B Mechanic)

GROUP II: Burner, Drill Operator, Jumbo Driller, Wagon Driller, Air Track Driller, Hydraulic Driller, Self Contained Rotary Drill Operator, Pneumatic Dowel Driller, Concrete Form Aligner, Concrete Form and Curb Form Highway, Concrete Finisher, Asphalt Raker, Pipe Fusion, Wrecking "Bar Person", Operator Qualified Peer Checker.

GROUP III: Asphalt Curb Machine Operator, Jeepers Operator, Pavement Breaker Operator , Power Saw Operator, Jack Hammer Drill, all types Pneumatic Tool and Gasoline Drill, Concrete Saw, Gunning, Railroad, Spike Puller, Sandblasting, Shoring, Pipe Layer, Deck Winches on Scows, Power Buggy and Operator, Power Wheelbarrow Operator, Laser Bean and X-Ray Operator, Pipe Religner, Underpinning, Chain Saw, Tree Cutter, Jack Leg Driller, Hydraulic Rock Splitter, certified, Certified Scaffold Erector, Remote Controlled Demolition Robot, Wrecking "Bar Person" Helper, Utility Per Diem Laborer, Compressed air-lance, Water jet lance

Group IV: General Concrete Laborers - anything pertaining to concrete, aggregate or concrete material handling, Puddlers, Asphalt Worker, Crack Router Operator, Rock Scalers, Vibrator Operator, Bit Grinder, Concrete Grinder, Remote Walk Behind Roller (Wacker, Rammax, etc), Air Tampers and All Tampers not covered by any other classification, Form Pin Pullers, Pumps and their operation, Service of Air Power, Epoxy and Waterproofing Worker, Fine Grade person between forms, Barco Rammer, Guard Rail Installation and Demolition Link Fence, Steel Kings, Wire Mesh, Setting of all Paving Blocks, Brick Paver and Rubber Pavers, Rip Rap and Dry Stone Layer Wall, Stone Work and Pointing, Cement Spray Men, Gabion Basket Assembler, Installation of Noise Barrier, Jersey Barrier and Joints, Pre-Cast Manholes, and Pre -cast and Pre-cast Catch Basins, Crib Retaining Walls

Group V: All Driller Helpers(including Hydraulic Wagon Air Track). Common Laborers, Certified Fire Watch Laborers, All AFL/CIO Trades, Signal Person Truck Spotters, Power Person , Landscaping and Nursery Person, Artificial Turf, Placing Fabric on Landfill, Sign Installer, Temporary and Interim Pavement Line Striping, String Line Automation Grades, Lock Level, Certified Traffic Safety and Control (Pattern)

Group V (A): Flagperson

Group VI: Confined Space Laborer

WAGES per hour	07/01/2024
Group I:	$ 49.05
Group II:	47.70
Group III:	47.30
Group IV:	46.95
Group V:	46.60
Group V(A):	40.25
Group VI:	48.60

Note: All employees working on a project that requires Hazwopper Certification will receive $1.00 per hour over job classification rate of pay.

SHIFT WORK
Supplemental Benefits: $ 40.00*

*Applies for contracting agency mandated irregular shift work

All employees who work an irregular work day that starts after 9:00 AM on a governmental mandated schedule shall be paid an additional 15% per hour.

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2024
Journeyman	$ 29.30

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid:	See (5, 6) on HOLIDAY PAGE
Overtime:	See (5, 6) on HOLIDAY PAGE

Note: Whenever a holidays falls on Sunday, it will be observed on the following Monday.

REGISTERED APPRENTICES
Wages per hour
1000 hour year terms

1st Term	$ 28.08
2nd Term	31.90
3rd Term	35.72
4th Term	39.54

Note: All employees working on a project that requires Hazwopper Certification will receive $1.00 per hour over job classification rate of pay.

Supplemental Benefits per hour:

All Terms	$ 23.60

8-235h

JOB DESCRIPTION Laborer - Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Columbia: Only the Townships of Claverack, Clermont, Greenport, Philmont, Germantown,Livingston, Hillsdale, Taghkanic, Gallatin, Copake, Ancram, City of Hudson.

WAGES
ALL WORK RELATED WITH TOXIC OR ANY ASBESTOS OR HAZARDOUS MATERIAL, BIOREMEDIATION AND PHYTO REMEDIATION(Five feet or more outside of building foundation line)

WAGES:(per hour)	07/01/2024
Class 3	$ 50.75

* To be allocated at a later date.

SHIFT WORK
SHIFT DIFFERENTIAL: Night work and irregular shift require 20% increase on wages for all Government mandated night and irregular shift work.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 33.38
Shift	39.18

OVERTIME PAY
See (B, E, P, *R, **S, ***T, X) on OVERTIME PAGE
*For Mon-Fri Holidays, Double Benefits to be paid for all hours worked.
**For Saturday Holidays, Two and one-half Benefits for all hours worked.
***For Sunday Holidays, Triple Benefits for all hours worked.

HOLIDAY
Paid: See (5, 6, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 25) on HOLIDAY PAGE
To be eligible for a paid holiday, an employee must work at least two (2) days in the calendar week or payroll week in which the holiday falls.

REGISTERED APPRENTICES
(1000) hour terms at the following wages.

	07/01/2024
1st term	$ 28.05
2nd term	32.35
3rd term	36.70
4th term	41.00

Supplemental Benefits per hour:

All Terms Regular	$ 29.23
All Terms Shift Rate	34.18

11-17tox HH

Laborer - Tunnel 01/01/2025

JOB DESCRIPTION Laborer - Tunnel **DISTRICT** 11

ENTIRE COUNTIES
Columbia, Dutchess, Greene, Orange, Otsego, Putnam, Rockland, Sullivan, Ulster, Westchester

PARTIAL COUNTIES
Chenango: Townships of Columbus, Sherburne and New Berlin.
Delaware: Townships of Andes, Bovina, Middletown, Roxbury, Franklin, Hamden, Stamford, Delhi, Kortright, Harpersfield, Merideth and Davenport.

WAGES
Class 1: All support laborers/sandhogs working above the shaft or tunnel.

Class 2: All laborers/sandhogs working in the shaft or tunnel.

Class 4: Safety Miners

Class 5: Site work related to Shaft/Tunnel

WAGES: (per hour)

	07/01/2024	06/01/2025

Class 1	$ 57.05	$ 58.55
Class 2	59.20	60.70
Class 4	65.60	67.10
Class 5	49.90	51.40

Toxic and hazardous waste, lead abatement and asbestos abatement work will be paid an additional $ 3.00 an hour.

SHIFT WORK

SHIFT DIFFERENTIAL...On all Government mandated irregular shift work:

- Employee shall be paid at time and one half the regular rate Monday through Friday.
- Saturday shall be paid at 1.65 times the regular rate.
- Sunday shall be paid at 2.15 times the regular rate.

SUPPLEMENTAL BENEFITS

Per hour:

Benefit 1	$ 36.98	$ 38.23
Benefit 2	55.39	59.99
Benefit 3	74.58	76.73

Benefit 1 applies to straight time hours, paid holidays not worked.
Benefit 2 applies to over 8 hours in a day (M-F), irregular shift work hours worked, and Saturday hours worked.
Benefit 3 applies to Sunday and Holiday hours worked.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16, 25) on HOLIDAY PAGE

When a recognized Holidays falls on Saturday or Sunday, holidays falling on Saturday shall be recognized or observed on Friday and holidays falling on Sunday shall be recognized or observed on Monday. Employees ordered to work on the Saturday or Sunday of the holiday or on the recognized or the observed Friday or Monday for those holidays falling on Saturday or Sunday shall receive double time the established rate and benefits for the holiday.

REGISTERED APPRENTICES

FOR APPRENTICE RATES, refer to the appropriate Laborer Heavy & Highway wage rate contained in the wage schedule for the County and location where the work is to be performed.

11-17/60/235/754Tun

Lineman Electrician — 01/01/2025

JOB DESCRIPTION Lineman Electrician **DISTRICT** 6

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES

A Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors, assembly of all electrical materials, conduit, pipe, or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

Crane Operators: Operation of any type of crane on line projects.
Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on line projects.
Digging Machine Operator: All other digging equipment and augering on line projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

NOTE: Includes Teledata Work within ten (10) feet of High Voltage Transmission Lines. Also includes digging of holes for poles, anchors, footer, and foundations for electrical equipment.

Below rates applicable on all overhead and underground distribution and maintenance work, and all overhead and underground transmission line work and the installation of fiber optic cable where no other construction trades are or have been involved. Includes access matting for line work.

Per hour:	07/01/2024
Group A:	
Lineman, Technician	$ 58.90
Crane, Crawler Backhoe	58.90
Welder, Cable Splicer	58.90
Group B:	
Digging Mach. Operator	53.01
Tractor Trailer Driver	50.07
Groundman, Truck Driver	47.12
Equipment Mechanic	47.12
Flagman	35.34

Additional $1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all electrical sub-stations, switching structures, fiber optic cable and all other work not defined as "Utility outside electrical work." Includes access matting for line work.

Group A:	
Lineman, Technician	$ 58.90
Crane, Crawler Backhoe	58.90
Cable Splicer	64.79
Certified Welder, Pipe Type Cable	61.85
Group B:	
Digging Mach. Operator	53.01
Tractor Trailer Driver	50.07
Groundman, Truck Driver	47.12
Equipment Mechanic	47.12
Flagman	35.34

Additional $1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all switching structures, maintenance projects, railroad catenary install/maintenance third rail installation, bonding of rails and pipe type cable and installation of fiber optic cable. Includes access matting for line work.

Group A:	
Lineman, Tech, Welder	$ 60.22
Crane, Crawler Backhoe	60.22
Cable Splicer	66.24
Certified Welder, Pipe Type Cable	63.23
Group B:	
Digging Mach. Operator	54.20
Tractor Trailer Driver	51.19
Groundman, Truck Driver	48.18
Equipment Mechanic	48.18
Flagman	36.13

Additional $1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all overhead and underground transmission line work & fiber optic cable where other construction trades are or have been involved. This applies to transmission line work only, not other construction. Includes access matting for line work.

Group A:	
Lineman, Tech, Welder	$ 61.41
Crane, Crawler Backhoe	61.41
Group B:	
Digging Mach. Operator	55.27
Tractor Trailer Driver	52.20
Groundman, Truck Driver	49.13
Equipment Mechanic	49.13

Flagman	36.85

Additional $1.00 per hour for entire crew when a helicopter is used.

SHIFT WORK

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM to 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM to 1:00 AM REGULAR RATE PLUS 17.3 %
3RD SHIFT	12:30 AM to 9:00 AM REGULAR RATE PLUS 31.4 %

SUPPLEMENTAL BENEFITS

Per hour:

	07/01/2024
Group A	$ 30.90 *plus 7% of the hourly wage paid
Group B	$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for all emergency work designated by the Dept. of Jurisdiction.
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid	See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.
Overtime	See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

07/01/2024
$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249a

Lineman Electrician - Teledata — 01/01/2025

JOB DESCRIPTION Lineman Electrician - Teledata **DISTRICT** 6

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

Per hour:

For outside work, stopping at first point of attachment (demarcation).

07/01/2024	01/01/2025

Cable Splicer	$ 39.24	$ 40.81
Installer, Repairman	$ 37.24	$ 38.73
Teledata Lineman	$ 37.24	$ 38.73
Tech., Equip. Operator	$ 37.24	$ 38.73
Groundman	$ 19.74	$ 20.53

NOTE: EXCLUDES Teledata work within ten (10) feet of High Voltage (600 volts and over) transmission lines. For this work please see LINEMAN.

SHIFT WORK
THE FOLLOWING RATES APPLY WHEN THE CONTRACTING AGENCY MANDATES MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION ARE WORKED. WHEN TWO (2) OR THREE (3) SHIFTS ARE WORKED THE FOLLOWING RATES APPLY:

1ST SHIFT	REGULAR RATE
2ND SHIFT	REGULAR RATE PLUS 10%
3RD SHIFT	REGULAR RATE PLUS 15%

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2024	01/01/2025
Journeyworker	$ 5.70 *plus 3% of the hour wage paid	$ 5.70 *plus 3% of the hour wage paid

*The 3% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16) on HOLIDAY PAGE

6-1249LT - Teledata

Lineman Electrician - Traffic Signal, Lighting — 01/01/2025

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting **DISTRICT** 6

ENTIRE COUNTIES
Columbia, Dutchess, Orange, Putnam, Rockland, Ulster

WAGES
Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors which includes, but is not limited to road loop wires; conduit and plastic or other type pipes that carry conductors, flex cables and connectors, and to oversee the encasement or burial of such conduits or pipes.

Crane Operators: Operation of any type of crane on Traffic Signal/Lighting projects.
Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on Traffic Signal/Lighting projects.
Digging Machine Operator: All other digging equipment and augering on Traffic Signal/Lighting projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

A flagger's duties shall consist of traffic control only.

Per hour:	07/01/2024
Group A:	
Lineman, Technician	$ 51.82
Crane, Crawler Backhoe	51.82
Certified Welder	54.41

Group B:

Digging Machine	46.64
Tractor Trailer Driver	44.05
Groundman, Truck Driver	41.46
Equipment Mechanic	41.46
Flagman	31.09

Above rates are applicable for installation, testing, operation, maintenance and repair on all Traffic Control (Signal) and Illumination (Lighting) projects, Traffic Monitoring Systems, and Road Weather Information Systems. Includes digging of holes for poles, anchors, footer foundations for electrical equipment; assembly of all electrical materials or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

SHIFT WORK

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM TO 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM REGULAR RATE PLUS 31.4%

SUPPLEMENTAL BENEFITS

Per hour worked:

	07/01/2024
Group A:	$ 30.90 *plus 7% of the hourly wage paid
Group B	$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for all emergency work designated by the Dept. of Jurisdiction.
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.
Overtime: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

07/01/2024
$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249aReg8LT

Lineman Electrician - Tree Trimmer **01/01/2025**

JOB DESCRIPTION Lineman Electrician - Tree Trimmer **DISTRICT** 6

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

WAGES

Applies to line clearance, tree work and right-of-way preparation on all new or existing energized overhead or underground electrical, telephone and CATV lines. This also includes stump removal near underground energized electrical lines including telephone and CATV lines.

Per hour:	07/01/2024
Tree Trimmer	$ 31.44
Equipment Operator	27.80
Equipment Mechanic	27.80
Truck Driver	23.15
Groundman	19.07
Flag person	15.00*

*NOTE-Rate effective on 01/01/2025 - $15.50 due to minimum wage increase.

SUPPLEMENTAL BENEFITS

Per hour:

	07/01/2024
Journeyworker	$ 10.48 *plus 4.5% of the hourly wage paid

* The 4.5% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE

WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (5, 6, 8, 15) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 16, 25) on HOLIDAY PAGE

NOTE: All paid holidays falling on a Saturday shall be observed on the preceding Friday. All paid holidays falling on a Sunday shall be observed on the following Monday.

6-1249TT

Mason - Building — 01/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per Hour:

	07/01/2024	01/06/2025
Marble Cutters & Setters	$ 63.92	$ 64.21

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker	$ 40.05	$ 40.51

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage Per Hour:

750 hour terms at the following wage

1st	2nd	3rd	4th	5th	6th	7th	8th

0-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6751-7500	7500+
07/01/2024							
$ 27.01	$ 40.52	$ 43.88	$ 47.26	$ 50.64	$ 54.32	$ 60.71	$ 63.92
01/06/2025							
$ 27.24	$ 40.84	$ 44.25	$ 47.63	$ 51.05	$ 54.58	$ 60.99	$ 64.21

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2024							
$ 26.42	$ 29.76	$ 30.61	$ 31.44	$ 32.28	$ 37.55	$ 39.23	$ 40.05
01/06/2025							
$ 26.88	$ 30.14	$ 30.95	$ 31.78	$32.59	$38.07	$ 39.71	$ 40.51

9-7/4

Mason - Building — 01/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Sullivan, Ulster

PARTIAL COUNTIES
Orange: Entire county except the Township of Tuxedo.

WAGES
Per hour:

	07/01/2024
Bricklayer	$ 46.45
Cement Mason	46.45
Plasterer/Stone Mason	46.45
Pointer/Caulker	46.45

Additional $1.00 per hour for power saw work
Additional $0.50 per hour for swing scaffold or staging work

SHIFT WORK
SHIFT WORK: When shift work or an irregular workday is mandated or required by state, federal, county, local or other governmental agency contracts, the following premiums apply:
Irregular workday requires 15% premium
Second shift an additional 15% of wage plus benefits to be paid
Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 38.00

OVERTIME PAY

Cement Mason	See (B, E, Q, W) on OVERTIME PAGE.
All Others	See (B, E, Q) on OVERTIME PAGE.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 16, 25) on HOLIDAY PAGE

Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.

REGISTERED APPRENTICES
Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th

50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5du-b

Mason - Building 01/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Sullivan, Ulster

WAGES

Per hour:	07/01/2024	12/02/2024
Tile, Marble,& Terrazzo Mechanic/Setter	$ 58.06	$ 58.23

SUPPLEMENTAL BENEFITS

Per Hour:		
Journeyworker:	$ 25.11* +6.14	$ 25.56* +6.15

* This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
Double time rate applies after 10 hours

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:
(Counties of Orange & Putnam)
750 hour terms at the following wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-	751-	1501-	2251-	3001-	3751-	4501-	5251-	6001-	6751-
750	1500	2250	3000	3750	4500	5250	6000	6750	7500
07/01/2024									
$22.19	$27.21	$34.45	$39.46	$43.07	$46.58	50.23	$55.24	$57.71	$62.00
12/02/2024									
$22.29	$27.35	$34.36	$39.41	$43.05	$46.60	$50.29	$55.33	$57.84	$62.20

Supplemental Benefits per hour:
(Counties of Orange & Putnam)

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
07/01/2024									
$12.55* + 0.76	$12.55* + 0.81	$15.36* + 0.91	$15.36* + 0.96	$16.36* + 1.43	$17.86* + 1.48	$18.86* + 1.91	$18.86* + 1.97	$18.86* + 4.57	$24.11* + 5.18
12/02/2024									
$12.70* + 0.76	$12.70* + 0.81	$15.81* + 0.91	$15.81* + 0.96	$16.81* + 1.43	$18.31* + 1.48	$19.31* + 1.91	$19.31* + 1.97	$19.31* + 4.57	$24.56* + 5.18

Wages per hour:
(Counties of Dutchess, Sullivan, Ulster)

750 hour terms at the following wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-	751-	1501-	2251-	3001-	3751-	4501-	5251-	6001-	6751-
750	1500	2250	3000	3750	4500	5250	6000	6750	7500

07/01/2024									
$22.06	$26.44	$28.50	$32.88	$35.84	$39.71	$43.21	$46.59	$47.95	$51.44
12/02/2024									
$22.06	$26.44	$28.50	$32.88	$35.84	$39.71	$43.21	$46.59	$47.95	$51.94

Supplemental Benefits per hour:
(Counties of Dutchess, Sullivan, Ulster)

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
07/01/2024									
$12.55* + 0.76	$12.55* + 0.80	$14.86* + 0.85	$14.86* + 0.89	$15.86* + 1.35	$16.36* + 1.40	$16.86* + 1.82	$17.86* + 1.87	$17.86* + 4.93	$22.61* + 5.02
12/02/2024									
$12.55* + 0.76	$12.55* + 0.80	$14.86* + 0.85	$14.86* + 0.89	$15.86* + 1.35	$16.36* + 1.40	$16.86* + 1.82	$17.86* + 1.87	$17.86* + 4.93	$22.61* + 5.02

* This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52B

Mason - Building — 01/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Sullivan, Ulster

WAGES

Per hour:	07/01/2024	12/02/2024
Building		
Tile, Marble, &		
Terrazzo Finisher	$ 47.74	$ 47.82

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Journeyworker:

Per Hour	$ 22.11*	$ 22.56*
	+ 6.01	+ 6.02

*This portion of benefits subject to same premium rate as shown for overtime wages

OVERTIME PAY
See (A, *E, Q) on OVERTIME PAGE
Double time rate applies after 10 hours on Saturdays.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88B-tf

Mason - Heavy&Highway — 01/01/2025

JOB DESCRIPTION Mason - Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Sullivan, Ulster

PARTIAL COUNTIES
Orange: Entire county except the Township of Tuxedo.

WAGES
Per hour:

	07/01/2024
Bricklayer	$ 46.95
Cement Mason	46.95
Marble/Stone Mason	46.95
Plasterer	46.95
Pointer/Caulker	46.95

Additional $1.00 per hour for power saw work
Additional $0.50 per hour for swing scaffold or staging work

SHIFT WORK
When shift work or an irregular workday is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:

Irregular workday requires 15% premium
Second shift an additional 15% of wage plus benefits to be paid
Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 38.00

OVERTIME PAY

Cement Mason	See (B, E, Q, W)
All Others	See (B, E, Q)

HOLIDAY

Paid:	See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime:	See (5, 6, 16, 25) on HOLIDAY PAGE

- Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.
- Supplemental Benefits are not paid for paid Holiday
- If Holiday is worked, Supplemental Benefits are paid for hours worked.
- Whenever an Employee works within three (3) calendar days before a holiday, the Employee shall be paid for the Holiday.

REGISTERED APPRENTICES
Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5du-H/H

Operating Engineer - Building — 01/01/2025

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Putnam, Queens, Richmond, Westchester

PARTIAL COUNTIES
Dutchess: that part of Dutchess County lying south of the North City Line of the City of Poughkeepsie.

WAGES
NOTE: Construction surveying
Party Chief--One who directs a survey party
Instrument Man--One who runs the instrument and assists Party Chief.
Rodman--One who holds the rod and assists the Survey Crew

Wages:(Per Hour) 07/01/2024

Building Construction:

Party Chief	$ 79.99
Instrument Man	60.36
Rodman	40.45

Steel Erection:

Party Chief	83.13
Instrument Man	64.21

Rodman	44.33

Heavy Construction-NYC counties only:
(Foundation, Excavation.)

Party Chief	88.06
Instrument man	65.66
Rodman	55.70

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2024
Building Construction	$ 28.63* +$ 7.65
Steel Erection	29.23* + 7.65
Heavy Construction	30.04* + 7.64

* This portion subject to SAME premium as wages

Non-Worked Holiday Supplemental Benefit:
21.83

OVERTIME PAY
See (A, B, E, Q) on OVERTIME PAGE
Code "A" applies to Building Construction and has double the rate after 7 hours on Saturdays.
Code "B" applies to Heavy Construction and Steel Erection and had double the rate after 8 hours on Saturdays.

HOLIDAY

Paid:	See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime:	See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

9-15Db

Operating Engineer - Building — 01/01/2025

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES
GROUP I:
Cranes (All Types up to 49 tons), Boom Trucks, Cherry Pickers (All Types), Clamshell Crane, Derrick (Stone and Steel), Dragline, Franki Pile Rig or similar, High Lift (Lull or similar) with crane attachment and winch used for hoisting or lifting, Hydraulic Cranes, Pile Drivers, Potain and similar.

Cranes (All types 50-99 tons), Drill Rig Casa Grande (CAT or similar), Franki Pile Rig or similar, Hydraulic Cranes (All types including Crawler Cranes- No specific boom length).

Cranes (All types 100 tons and over), All Tower Cranes, All Climbing Cranes irrespective of manufacturer and regardless of how the same is rigged, Franki Pile Rig or similar, Conventional Cranes (All types including Crawler Cranes-No specific boom length), Hydraulic Cranes.

GROUP I-A: Barber Green Loader-Euclid Loader, Bulldozer, Carrier-Trailer Horse, Concrete Cleaning Decontamination Machine Operator, Concrete-Portable Hoist, Conway or Similar Mucking Machines, Elevator & Cage, Excavators all types, Front End Loaders, Gradall, Shovel, Backhoe, etc.(Crawler or Truck), Heavy Equipment Robotics Operator/Mechanic, Hoist Engineer-Material, Hoist Portable Mobile Unit, Hoist(Single, Double or Triple Drum), Horizontal Directional Drill Locator, Horizontal Directional Drill Operator and Jersey Spreader, Letourneau or Tournapull(Scrapers over 20 yards Struck), Lift Slab Console, etc., Lull HiLift or Similar, Master Environmental Maintenance Mechanics, Mucking Machines Operator/Mechanic or Similar Type, Overhead Crane, Pavement Breaker(Air Ram), Paver(Concrete), Post Hole Digger, Power House Plant, Road Boring Machine, Road Mix Machine, Ross Carrier and Similar Machines, Rubber tire double end backhoes and similar machines, Scoopmobile Tractor-Shovel Over 1.5 yards, Shovel (Tunnels), Spreader (Asphalt) Telephie(Cableway), Tractor Type Demolition Equipment, Trenching Machines-Vermeer Concrete Saw Trencher and Similar, Ultra High Pressure Waterjet Cutting Tool System, Vacuum Blasting Machine operator/mechanic, Winch Truck A Frame.

GROUP I-B: Compressor (Steel Erection), Mechanic (Outside All Types), Negative Air Machine (Asbestos Removal), Push Button (Buzz Box) Elevator.

GROUP II: Compactor Self-Propelled, Concrete Pump, Crane Operator in Training (Over 100 Tons), Grader, Machines Pulling Sheep's Foot Roller, Roller (4 ton and over), Scrapers (20 yards Struck and Under), Vibratory Rollers, Welder.

GROUP III-A: Asphalt Plant, Concrete Mixing Plants, Forklift (All power sources), Joy Drill or similar, Tractor Drilling Machine, Loader (1 1/2 yards and under), Portable Asphalt Plant, Portable Batch Plant, Portable Crusher, Skid Steer (Bobcat or similar), Stone Crusher, Well Drilling Machine, Well Point System.

GROUP III-B: Compressor Over 125 cu. Feet, Conveyor Belt Machine regardless of size, Compressor Plant, Ladder Hoist, Stud Machine.

GROUP IV-A: Batch Plant, Concrete Breaker, Concrete Spreader, Curb Cutter Machine, Finishing Machine-Concrete, Fine Grading Machine, Hepa Vac Clean Air Machine, Material Hopper(sand, stone, cement), Mulching Grass Spreader, Pump Gypsum etc, Pump-Plaster-Grout-Fireproofing. Roller(Under 4 Ton),Spreading and Fine Grading Machine, Steel Cutting Machine, Siphon Pump, Tar Joint Machine, Television Cameras for Water, Sewer, Gas etc. Turbo Jet Burner or Similar Equipment, Vibrator (1 to 5).

GROUP IV-B: Compressor (all types), Heater (All Types), Fire Watchman, Lighting Unit (Portable & Generator) Pump, Pump Station(Water, Sewer, Portable, Temporary), Welding Machine (Steel Erection & Excavation).

GROUP V: Mechanics Helper, Motorized Roller (walk behind), Stock Attendant, Welder's Helper, Maintenance Engineer Crane(75 ton and over).

Group VI-A: Welder Certified
GROUP VI-B: Utility Man, Warehouse Man.

WAGES: (per hour)

	07/01/2024
GROUP I	
Cranes- up to 49 tons	$ 67.43
Cranes- 50 tons to 99 tons	69.77
Cranes- 100 tons and over	79.64
GROUP I-A	59.04
GROUP I-B	54.41
GROUP II	56.97
GROUP III-A	54.88
GROUP III-B	52.25
GROUP IV-A	54.33
GROUP IV-B	45.94
GROUP V	49.53
Group VI-A	57.96
GROUP VI-B	
Utility Man	47.00
Warehouse Man	49.26

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects.
Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional $2.00 per hour.
Engineers operating cranes with booms 149 feet or over in length will be paid an additional $3.00 per hour.
Loader operators over 5 cubic yard capacity additional .50 per hour.
Shovel operators over 4 cubic yard capacity additional $1.00 per hour.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 32.32

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE

8-137B

Operating Engineer - Building 01/01/2025

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 1

ENTIRE COUNTIES
Albany, Clinton, Columbia, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Montgomery, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Warren, Washington

PARTIAL COUNTIES

Dutchess: Defined as north of the northern boundary line of City of Poughkeepsie then due east to Route 115 to Bedell Road then east along Bedell Road to VanWagner Road then north along VanWagner Road to Bower Road then east along Bower Road to Rte. 44 east to Route 343 then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to Connecticut.

WAGES

NOTE:
-- In the event that equipment listed below is operated by robotic control, the classification covering the operation will be the same as if manually operated.
-- If a second employee is required by the employer for operation of any covered machine, they shall be an Engineer Class C

CLASS A1*: All cranes that require A NYS crane license, tower cranes**(including self erecting), hydraulic cranes, locomotive crane, piledriver, cableway, derricks, whirlies, dragline, boom trucks, cherry pickers, overhead cranes (gantry or saddle type), truck cranes

CLASS A:
Shovel, Excavators 18,001 lbs. and above(including rubber tire full swing), Gradalls, power road grader, all CMI equipment, front-end rubber tire loader, tractor-mounted drill (quarry master), mucking machine, concrete central mix plant, concrete pump, belcrete system, automated asphalt concrete plant, and tractor road paver, boom trucks 5 tons and under, maintenance engineer, self-contained crawler drill-hydraulic rock drill, Profiler/Milling machine.

CLASS B:
Excavators 18,000 lbs. and under, Backhoes (rubber tired backhoe/loader combination), bulldozer, pushcat, tractor, traxcavator, scraper, LeTourneau grader, form fine grader, self-propelled soil compactor (fill roller), asphalt roller, blacktop spreader, power brooms, sweepers, trenching machine, Barber Green loader, side booms, hydro hammer, concrete spreader, concrete finishing machine, one drum hoist, power hoisting (single drum), hoist two drum or more, three drum engine, power hoisting (two drum and over), two drum and swinging engine, three drum swinging engine, hod hoist, A-L frame winches, core and well drillers (one drum), post hole digger, model CHB Vibro-Tamp or similar machine, batch bin and plant operator, dinky locomotive, skid steer loader, track excavator 5/8 cubic yard or smaller, front end rubber tired loader under four cubic yards, vacum machine (mounted or towed).

CLASS C:
Fork lift, high lift, all terrain fork lift: or similar, oiler, fireman and heavy-duty greaser, boilers and steam generators, pump, vibrator, motor mixer, air compressor, dust collector, welding machine, well point, mechanical heater, generators, temporary light plants, electric submersible pumps 4" and over, murphy type diesel generator, conveyor, elevators, concrete mixer, beltcrete power pack (belcrete system), seeding, and mulching machines, pumps, rotating telehandler (that does not require NYS crane license).

WAGES per hour

	07/01/2024	07/01/2025
Class A1*	$ 53.11	$ 55.42
Class A	52.62	54.93
Class B	51.60	53.91
Class C	48.70	51.01

(*) TONNAGE RATING PREMIUMS:
Note: Additional value subject to same premiums as shown for OT
All cranes 1000 tons and over, A1 rate plus $7.00
All cranes 800-999 tons, A1 rate plus $6.00
All cranes 600-799 tons, A1 rate plus $5.00
All cranes 400-599 tons, A1 rate plus $4.00
All cranes 200-399 tons, A1 rate plus $3.00
All cranes 111-199 tons, A1 rate plus $2.25
All cranes 110 tons and under, A1 rate only

(**)Additional $0.50 per hr on A1 rate for Tower Cranes (no tonnage premiums apply)
Additional $2.50 per hr over B rate for Nuclear Leader work.
Additional $2.50 per hour if work requires Personal Protective Equipment for hazardous waste site activities with a level C or over rating.

SUPPLEMENTAL BENEFITS

Per hour

	07/01/2024	07/01/2025
Journeyworker	$ 32.40	$ 33.50

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: All hours worked on designated holidays shall be paid a double the hourly rate of pay plus 8 hours of straight time.
NOTE: If a holiday falls on Sunday, it will be celebrated on Monday. If the holiday falls on Saturday, it will be celebrated on Friday.

REGISTERED APPRENTICES
Wages per hour

1000 hours terms at the following percentage of Journeyworker's wage Class B

1st	2nd	3rd	4th
60%	70%	80%	90%

Supplemental Benefits per hour worked

	07/01/2024	07/01/2025
All terms	$ 27.70	$ 28.80

1-158 Alb

Operating Engineer - Building — 01/01/2025

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 1

ENTIRE COUNTIES
Broome, Chenango, Tioga

PARTIAL COUNTIES
Dutchess: Defined as north of the northern boundary line of City of Poughkeepsie then due east to Route 115 to Bedell Road then east along Bedell Road to VanWagner Road then north along VanWagner Road to Bower Road then east along Bower Road to Rte. 44 east to Route 343 then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to Connecticut.

WAGES
NOTE:
--In the event that equipment listed below is operated by robotic control, the classification covering the operation will be the same as if manually operated.
--If a second employee is required by the employer for operation of any covered machine, they shall be an Engineer Class C

CLASS A1*: All cranes that require NYS crane license, tower cranes**(including self erecting), hydraulic cranes, locomotive crane, piledriver, cableway, derricks, whirlies, dragline, boom trucks, cherry pickers, overhead cranes (gantry or saddle type), truck cranes

CLASS A:
Shovel, Excavators 18,001 lbs. and above(including rubber tire full swing), Gradalls, power road grader, all CMI equipment, front-end rubber tire loader, tractor-mounted drill (quarry master), mucking machine, concrete central mix plant, concrete pump, belcrete system, automated asphalt concrete plant, and tractor road paver, boom trucks 5 tons and under, maintenance engineer, self-contained crawler drill-hydraulic rock drill, Profiler/Milling machine.

CLASS B:
Excavators 18,000 lbs. and under, Backhoes (rubber tired backhoe/loader combination), bulldozer, pushcat, tractor, traxcavator, scraper, LeTourneau grader, form fine grader, self-propelled soil compactor (fill roller), asphalt roller, blacktop spreader, power brooms, sweepers, trenching machine, Barber Green loader, side booms, hydro hammer, concrete spreader, concrete finishing machine, one drum hoist, power hoisting (single drum), hoist two drum or more, three drum engine, power hoisting (two drum and over), two drum and swinging engine, three drum swinging engine, hod hoist, A-L frame winches, core and well drillers (one drum), post hole digger, model CHB Vibro-Tamp or similar machine, batch bin and plant operator, dinky locomotive, skid steer loader, track excavator 5/8 cubic yard or smaller, front end rubber tired loader under four cubic yards, vacum machine (mounted or towed).

CLASS C:
Fork lift, high lift, all terrain fork lift: or similar, oiler, fireman and heavy-duty greaser, boilers and steam generators, pump, vibrator, motor mixer, air compressor, dust collector, welding machine, well point, mechanical heater, generators, temporary light plants, electric submersible pumps 4" and over, murphy type diesel generator, conveyor, elevators, concrete mixer, beltcrete power pack (belcrete system), seeding, and mulching machines, pumps, rotating telehandler (that does not require NYS crane license).

WAGES per hour

	07/01/2024	07/01/2025
Class A1*	$ 49.65	$ 51.71
Class A	47.25	49.31
Class B	46.79	48.85
Class C	44.48	46.54

(*) TONNAGE RATING PREMIUMS:
Note: Additional value subject to same premiums as shown for OT
All cranes 1000 tons and over, A1 rate plus $7.00
All cranes 800-999 tons, A1 rate plus $6.00

All cranes 600-799 tons, A1 rate plus $5.00
All cranes 400-599 tons, A1 rate plus $4.00
All cranes 200-399 tons, A1 rate plus $3.00
All cranes 111-199 tons, A1 rate plus $2.25
All cranes 110 tons and under, A1 rate only

(**)Additional $0.50 per hr over A1 rate for Tower Cranes (no tonnage premium applies)
Additional $2.50 per hr over B rate for Nuclear Leader work.
Additional $2.50 per hour if work requires Personal Protective Equipment for hazardous waste site activities with a level C or over rating.

SUPPLEMENTAL BENEFITS
Per hour

	07/01/2024	07/01/2025
Journeyworker	$ 31.85	$ 32.95

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: All hours worked on designated holidays shall be paid a double the hourly rate of pay plus 8 hours of straight time.
NOTE: If a holiday falls on Sunday, it will be celebrated on Monday. If the holiday falls on Saturday, it will be celebrated on Friday.

REGISTERED APPRENTICES
Wages per hour

1000 hours terms at the following percentage of Journeyworker's wage Class B:

1st	2nd	3rd	4th
60%	70%	80%	90%

Supplemental Benefits per hour worked

	07/01/2024	07/01/2025
All terms	$ 27.25	$ 28.35

1-158 BCT

Operating Engineer - Heavy&Highway — 01/01/2025

JOB DESCRIPTION Operating Engineer - Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES
GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane, (Crawler, Truck),
Dragline, Drill Rig (Casa Grande, Cat, or Similar), Floating Crane (Crane on Barges) under 100 tons, Gin Pole, Hoist Engineer-Concrete (Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger (Truck or Truck Mounted), Boat Captain, Bulldozer-All Sizes, Central Mix Plant Operator, Chipper (all types), Close Circuit T.V., Combination Loader/Backhoe, Compactor with Blade, Concrete Finishing Machine, Gradall, Grader (Motor Grader), Elevator & Cage (Materials or Passenger), Excavator (and all attachments), Front End Loaders (1 1/2 yards and over), High Lift Lull and similar, Hoist (Single, Double, Triple Drum), Hoist Portable Mobile Unit, Hoist Engineer (Material), Jack and Bore Machine, Log Skidders, Mill Machines, Mucking Machines, Overhead Crane, Paver (concrete), Post Pounder (of any type), Push Cats, Road Reclaimer, Robot Hammer (Brokk or similar), Robotic Equipment (Scope of Engineer Schedule), Ross Carrier and similar, Scrapers (20 yard struck and over), Side Boom, Slip Form Machine, Spreader (Asphalt), Trenching Machines (Telephies-Vermeer Concrete Saw), Tractor Type Demolition Equipment, Vacuum Truck. Vibratory Roller(Riding) or Roller used in mainline paving operations.

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver (Asphalt).

GROUP II-A: Ballast Regulators, Compactor Self Propelled, Fusion Machine, Rail Anchor Machines, Roller (4 ton and over), Scrapers (20 yard struck and under).

GROUP II-B: Mechanic (Outside) All Types, Shop Mechanic.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler (High Pressure), Concrete Breaker (Track or Rubber Tire), Concrete Pump, Concrete Spreader, Excavator Drill, Farm Tractor, Forklift (all types), Gas Tapping (Live), Hydroseeder, Loader (1 1/2 yards and under), Locomotive (all sizes), Machine Pulling Sheeps Foot Roller, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher (Apprentice), Powerhouse Plant, Roller (under 4 ton), Sheer Excavator, Skid Steer/Bobcat, Stone Crusher, Sweeper (with seat), Well Drilling Machine.

GROUP IV: Service Person (Grease Truck), Deckhand.

GROUP IV-B: Conveyor Belt Machine (Truck Mounted), Heater (all types), Lighting Unit (Portable), Maintenance Engineer (For Crane Only), Mechanics Helper, Pump (Fireproofing), Pumps-Pump Station/Water/Sewer/Gypsum/Plaster, etc., Pump Truck (Sewer Jet or Similar), Welders Helper, Welding Machine (Steel Erection), Well Point System.

GROUP V: All Tower Cranes-All Climbing Cranes and all cranes of 100-ton capacity or greater (3900 Manitowac or similar) irrespective of manufacturer and regardless of how the same is rigged, Hoist Engineer (Steel), Engineer-Pile Driver, Jersey Spreader, Pavement Breaker/Post Hole Digger.

WAGES: Per hour:	07/01/2024
Group I	$ 68.63
Group I-A	60.42
Group I-B	63.70
Group II-A	57.84
Group II-B	59.67
Group III	56.81
Group IV	51.57
Group IV-B	44.19
Group V	
Engineer All Tower, Climbing and Cranes of 100 Tons	77.82
Hoist Engineer(Steel)	70.41
Engineer(Pile Driver)	75.13
Jersey Spreader, Pavement Breaker (Air Ram)Post Hole Digger	59.19

Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional $2.00 per hour over the rate listed in the Wage Schedule. Engineers operating cranes with booms 149 feet or over in length will be paid an additional $3.00 per hour over the rate listed in the Wage Schedule. Loader and Excavator Operators: over 5 cubic yards capacity $0.50 per hour over the rate listed in the Wage Schedule. Shovel Operators: over 4 cubic yards capacity $1.00 per hour over the rate listed in the Wage Schedule.

SHIFT WORK
A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts on all government mandated off-shift work

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker:	$ 34.85 up to 40 Hours After 40 hours $ 25.55* PLUS $ 1.25 on all hours worked

*This amount is subject to premium

OVERTIME PAY
See (B, E, P, *R, **U) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime..... See (5, 6, 8, 15, 25, 26) on OVERTIME PAGE

* For Holiday codes 8,15,25,26 code R applies
** For Holiday Codes 5 & 6 code U applies

Note: If employees are required to work on Easter Sunday they shall be paid at the rate of triple time.

REGISTERED APPRENTICES
(1)year terms at the following rate.

1st term	$ 30.21
2nd term	36.25

3rd term	42.30
4th term	48.34
Supplemental Benefits per hour:	
	26.85

8-137HH

Operating Engineer - Heavy&Highway **01/01/2025**

JOB DESCRIPTION Operating Engineer - Heavy&Highway **DISTRICT** 1

ENTIRE COUNTIES
Albany, Broome, Chenango, Clinton, Columbia, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Montgomery, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Tioga, Warren, Washington

PARTIAL COUNTIES
Dutchess: Defined as north of the northern boundary line of City of Poughkeepsie then due east to Route 115 to Bedell Road then east along Bedell Road to VanWagner Road then north along VanWagner Road to Bower Road then east along Bower Road to Rte. 44 east to Route 343 then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to Connecticut.

WAGES
NOTE:
--- In the event that equipment listed below is operated by robotic control, the classification covering the operation will be the same as if manually operated.
--- If a second employee is required by the employer for operation of any covered machine, they shall be an Engineer Class C

CLASSIFICATION A1*: All Cranes that require a NYS Crane License; tower cranes(including self erecting)**, hydraulic cranes, locomotive crane, piledriver, cableway, derricks, whirlies, dragline, boom trucks, cherry pickers, overhead cranes (gantry or saddle type), truck cranes

CLASSIFICATION A:
Asphalt Curb Machine (Self Propelled, Slipform), Asphalt Paver, Automated Concrete Spreader (CMI Type), Automatic Fine Grader, Backhoe (Except Tractor Mounted, Rubber Tired), Backhoe Excavator Full Swing (CAT 212 or similar type), Back Filling Machine, Belt Placer (CMI Type), Blacktop Plant (Automated), Blacktop Roller, Boom truck, GPS operated Bull Dozer, Cableway, Caisson Auger, Central Mix Concrete Plant (Automated), Concrete Curb Machine (Self Propelled, Slipform), Concrete Pump, Crane, Cherry Picker, Derricks (steel erection), Dragline, Overhead Crane (Gantry or Straddle type), Pile Driver, Truck Crane, Directional Drilling Machine, Dredge, Dual Drum Paver, Excavator (All Purpose Hydraulically Operated) (Gradall or Similar), Front End Loader (4 cu. yd. and Over), Head Tower (Sauerman or Equal), Hoist (Two or Three Drum), Holland Loader, Maintenance Engineer, Mine Hoist, Mucking Machine or Mole, PB-4 and similar type, Power Grader, Profiler/Milling Machine (over 105 H.P.), Quad 9, Quarry Master (or equivalent), Rotating Telehandler, Scraper (Including Challenger Type), Shovel, Side Boom, Slip Form Paver (If a second man is needed, he shall be an Oiler), Tractor Drawn BeltType Loader, Truck or Trailer Mounted Log Chipper (Self Feeder), Tug Operator (Manned Rented Equipment Excluded), Tunnel Shovel

CLASSIFICATION B:
Backhoe (Tractor Mounted, Rubber Tired), Bituminous Recycler Machine, Bituminous Spreader and Mixer, Blacktop Plant (Non-Automated), Blast or Rotary Drill (Truck or Tractor Mounted), Brokk, Boring Machine, Cage Hoist, Central Mix Plant [(Non-Automated) and All Concrete Batching Plants], Concrete Paver (Over 16S), Crawler Drill (Self-contained), Crusher, Diesel Power Unit, Drill Rigs, Tractor Mounted, Front End Loader (Under 4 cu. yd.), Greaseman/Lubrication Engineer, Hi Pressure Boiler (15 lbs. and over), Hoist (One Drum), Hydro-Axe, Kolman Plant Loader and Similar Type Loaders (If Employer requires another man to clean the screen or to maintain the equipment, he shall be an Oiler), L.C.M. Work Boat Operator, Locomotive, Material handling knuckle boom, Mini Excavator (under 18,000 lbs.), Mixer (for stabilized base self-propelled), Monorail Machine, Plant Engineer, Prentice Loader, Profiler/Milling Machine (105 H.P. and under), Pug Mill, Pump Crete, Ready Mix Concrete Plant, Refrigeration Equipment (for soil stabilization), Road Widener, Roller (all above subgrade), Sea Mule, Self-contained Ride-on Rock Drill(Excluding Air-Track Type Drill), Skidder, Tractor with Dozer and/or Pusher, Trencher, Tugger Hoist, Vacum machine (mounted or towed), Vermeer saw (ride on, any size or type), Welder, Winch, Winch Cat

CLASSIFICATION C:
A Frame Winch Hoist on Truck, Articulated Heavy Hauler, Aggregate Plant, Asphalt or Concrete Grooving Machine (ride on), Ballast Regulator(Ride-on), Boiler (used in conjunction with production), Bituminous Heater (self-propelled), Boat (powered), Cement and Bin Operator, Concrete Pavement Spreader and Finisher Concrete Paver or Mixer (16' and under), Concrete Saw (self-propelled), Conveyor, Deck Hand, Directional Drill Machine Locator, Drill (Core and Well), Farm Tractor with accessories, Fine Grade Machine, Fireman, Fork Lift, Form Tamper, Grout Pump, Gunite Machine, Hammers (Hydraulic self-propelled), Hydra-Spiker (ride-on), Hydraulic Pump (jacking system), Hydro-Blaster (Water), Mulching Machine, Oiler, Parapet Concrete or Pavement Grinder, Post Hole Digger and Post Driver, Power Broom (towed), Power Heaterman, Power Sweeper, Revinius Widener, Roller (Grade and Fill), Scarifier (ride-on), Shell Winder, Skid steer loader (Bobcat or similar; including all attachments), Span-Saw (ride-on), Steam Cleaner, Tamper (ride-on), Tie Extractor (ride-on), Tie Handler (ride-on), Tie Inserter (ride-on), Tie Spacer (ride-on), Tire Repair, Track Liner (ride-on), Tractor, Tractor (with towed accessories), Vibratory Compactor, Vibro Tamp, Well Point, and the following hands-off equipment: Compressors, Dust Collectors, Generators, Pumps, Welding Machines, Light Plants and Heaters

WAGES per hour

	07/01/2024	07/01/2025

Class A1*	$ 57.90	$ 60.30
Class A	54.90	57.30
Class B	53.99	56.39
Class C	51.42	53.82

(*) TONNAGE RATING PREMIUMS:
Cranes over 1000 tons, A1 rate plus $7.00
Cranes from 800-999 tons, A1 rate plus $6.00
Cranes from 600-799 tons, A1 rate plus $5.00
Cranes from 400-599 tons, A1 rate plus $4.00
Cranes from 200-399 tons, A1 rate plus $3.00
Cranes from 111-199 tons, A1 rate plus $2.00
Cranes from 65-110 tons, A1 rate plus $1.50
Cranes from 0-64 Tons, A1 rate only
NOTE: Additional value subject to same premiums as shown for OT

(**) Tower Cranes, A1 rate plus $3.00 (no tonnage premiums apply)
-- Cranes in Luffer Configuration, A1 rate plus $5.00
-- Cranes with external ballast (tray or wagon), A1 rate plus $5.00
NOTE: Additional value subject to same premiums as shown for OT

Additional $2.50 per hr. for hazardous waste removal work on State and/or Federally designated waste site which require employees to wear Level C or above forms of personal protection.

SHIFT WORK
Additional $2.50 per hour for All Employees who work a single irregular work shift, of at least 5 consecutive days, starting from 5:00 PM to 1:00 AM that is mandated by the Contracting Agency.

SUPPLEMENTAL BENEFITS
Per hour

	07/01/2024	07/01/2025
Journeyworker	$ 32.60	$ 33.70

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: If the holiday falls on Sunday, it will be observed on Monday. If the observed Monday Holiday is worked, pay shall be double time plus Holiday pay for time worked. If the Holiday falls on a Saturday and is worked pay shall be double time plus Holiday pay for time worked. If the Holiday falls on a Saturday employer can choose to observe the paid holiday Saturday or give Friday off with holiday pay.

REGISTERED APPRENTICES
Wages per hour

1000 hours terms at the following percentage of Journeyworker's wage Class B

1st	2nd	3rd	4th
60%	70%	80%	90%

Supplemental Benefits per hour worked

	07/01/2024	07/01/2025
All Terms	$ 27.45	$ 28.30

1-158H/H Alb

Operating Engineer - Heavy&Highway — 01/01/2025

JOB DESCRIPTION Operating Engineer - Heavy&Highway **DISTRICT** 9

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: South of the North city line of Poughkeepsie

WAGES
Party Chief - One who directs a survey party
Instrument Man - One who runs the instrument and assists Party Chief
Rodman - One who holds the rod and in general, assists the Survey Crew
Categories cover GPS & Underground Surveying

Per Hour:	07/01/2024
Party Chief	$ 84.94
Instrument Man	63.15
Rodman	53.43

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2024
All Categories	
Straight Time:	$ 30.04* + $7.64
Premium:	
Time & 1/2	$ 45.06* + $7.64
Double Time	$ 60.08* + $7.64

Non-Worked Holiday Supplemental Benefits:
$ 21.83

OVERTIME PAY
See (B, *E, Q) on OVERTIME PAGE
* Doubletime paid on all hours in excess of 8 hours on Saturday

HOLIDAY
Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

9-15Dh

Operating Engineer - Heavy&Highway - Tunnel — 01/01/2025

JOB DESCRIPTION Operating Engineer - Heavy&Highway - Tunnel **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES
GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane(Crawler, Truck), Dragline, Drill Rig Casa Grande(Cat or Similar), Floating Crane(Crane on Barge-Under 100 Tons), Hoist Engineer(Concrete/Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger(Truck or Truck Mounted), Boat Captain, Bull Dozer-all sizes, Central Mix Plant Operator, Chipper-all types, Close Circuit T.V., Combination Loader/Backhoe, Compactor with Blade, Concrete Finishing Machine, Gradall, Grader(Motor Grader), Elevator & Cage(Materials or Passengers), Excavator(and all attachments), Front End Loaders(1 1/2 yards and over), High Lift Lull, Hoist(Single, Double, Triple Drum), Hoist Portable Mobile Unit, Hoist Engineer(Material), Jack and Bore Machine, Log Skidder, Milling Machine, Moveable Concrete Barrier Transfer & Transport Vehicle, Mucking Machines. Overhead Crane, Paver(Concrete), Post Pounder of any type, Push Cats, Road Reclaimer, Robot Hammer(Brokk or similar), Robotic Equipment(Scope of Engineer Schedule), Ross Carrier and similar machines, Scrapers(20 yards struck and over), Side Boom, Slip Form Machine, Spreader(Asphalt), Trenching Machines, Telephies-Vermeer Concrete Saw, Tractor type demolition equipment, Vacuum Truck, Vibratory Roller (Riding) used in mainline paving operations.

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver(Asphalt).

GROUP II-A: Ballast Regulators, Compactor(Self-propelled), Fusion Machine, Rail Anchor Machines, Roller(4 ton and over), Scrapers(20 yard struck and under).

GROUP II-B: Mechanic(outside)all types, Shop Mechanic.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler(High Pressure), Concrete Breaker(Track or Rubber Tire), Concrete Pump, Concrete Spreader, Excavator Drill, Farm Tractor, Forklift(all types of power), Gas Tapping(Live), Hydroseeder, Loader(1 1/2 yards and under), Locomotive(all sizes), Machine Pulling Sheeps Foot Roller, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher(Apprentice), Powerhouse Plant, Roller(under 4 ton), Sheer Excavator, Skidsteer/Bobcat, Stone Crusher, Sweeper(with seat), Well Drilling Machine.

GROUP IV-A: Service Person(Grease Truck), Deckhand.

GROUP IV-B: Conveyor Belt Machine(Truck Mounted), Heater(all types), Lighting Unit(Portable), Maintenance Engineer(for Crane only), Mechanics Helper, Pump(Fireproofing), Pumps-Pump Station/Water/Sewer/Gypsum/Plaster, etc., Pump Truck(Sewer Jet or similar), Welding Machine(Steel Erection), Welders Helper.

GROUP V-A: Engineer(all Tower Cranes, all Climbing Cranes & all Cranes of 100 ton capacity or greater),Hoist Engineer(Steel-Sub Structure), Engineer-Pile Driver, Jersey-Spreader, Pavement breaker, Post Hole Digger

WAGES: (per hour)

	07/01/2024
GROUP I	$ 68.63
GROUP I-A	60.42
GROUP I-B	63.70
GROUP II-A	57.84
GROUP II-B	59.67
GROUP III	56.81
GROUP IV-A	51.57
GROUP IV-B	44.19
GROUP V-A	
Engineer-Cranes	77.82
Engineer-Pile Driver	75.13
Hoist Engineer	70.41
Jersey Spreader/Post Hole Digger	59.19

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects. Operators required to use two buckets pouring concrete on other than road pavement shall receive $0.50 per hour over scale. Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional $2.00 per hour. Engineers operating cranes with booms 149 feet or over in length will be paid an additional $3.00 per hour. Operators of shovels with a capacity over (4) cubic yards shall be paid an additional $1.00 per hour. Operators of loaders with a capacity over (5) cubic yards shall be paid an additional $0.50 per hour.

SHIFT WORK

A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts
on all government mandated off-shift work

SUPPLEMENTAL BENEFITS

Per hour:
Journeyworker:

$ 34.85 up to 40 hours
After 40 hours $25.55 plus $1.25 on all hours worked

OVERTIME PAY

See (D, O, *U, V) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE

* Note: For Holiday codes 5 & 6, code U applies. For Holiday codes 8, 15, 25, 26, code R applies.

Note: If employees are required to work on Easter Sunday, they shall be paid at the rate of triple time.

REGISTERED APPRENTICES

(1)year terms at the following rates:

1st term	$ 30.21
2nd term	36.25
3rd term	42.30
4th term	48.34

Supplemental Benefits per hour:

All terms	$ 26.85

8-137Tun

Operating Engineer - Marine Dredging **01/01/2025**

JOB DESCRIPTION Operating Engineer - Marine Dredging **DISTRICT** 4

ENTIRE COUNTIES
Albany, Bronx, Cayuga, Clinton, Columbia, Dutchess, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Orange, Oswego, Putnam, Queens, Rensselaer, Richmond, Rockland, St. Lawrence, Suffolk, Ulster, Washington, Wayne, Westchester

WAGES
These wages do not apply to Operating Engineers on land based construction projects. For those projects, please see the Operating Engineer Heavy/Highway Rates. The wage rates below for all equipment and operators are only for marine dredging work in navigable waters found in the counties listed above.

Per Hour:	07/01/2024
CLASS A1 Deck Captain, Leverman, Mechanical Dredge Operator, Licensed Tug Operator 1000HP or more.	$ 45.26
CLASS A2 Crane Operator (360 swing)	40.33
CLASS B Dozer, Front Loader Operator on Land	To conform to Operating Engineer Prevailing Wage in locality where work is being performed including benefits.
CLASS B1 Derrick Operator (180 swing) Spider/Spill Barge Operator Operator II, Fill Placer, Engineer Chief Mate, Electrician,Chief Welder, Maintenance Engineer,Licensed Boat, Crew Boat Operator	39.14
CLASS B2 Certified Welder	36.84
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	35.83
CLASS C2 Boat Operator	34.68
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	28.81

SUPPLEMENTAL BENEFITS
Per Hour:
THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes A & B	$ 12.00 plus 7% of straight time wage, Overtime hours add $ 0.63
All Class C & D	$ 11.75 plus 7% of straight time wage, Overtime hours add $ 0.50

OVERTIME PAY
See (B2, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 26) on HOLIDAY PAGE

4-25a-MarDredge

Operating Engineer - Survey Crew **01/01/2025**

JOB DESCRIPTION Operating Engineer - Survey Crew **DISTRICT** 12

ENTIRE COUNTIES
Albany, Allegany, Broome, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Oneida, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Yates

PARTIAL COUNTIES
Dutchess: The northern portion of the county from the northern boundary line of the City of Poughkeepsie, north.
Genesee: Only the portion of the county that lies east of a line down the center of Route 98 to include all area that lies within the City of Batavia.

WAGES
These rates apply to Building, Tunnel and Heavy Highway.

Per hour:
SURVEY CLASSIFICATIONS:

Party Chief - One who directs a survey party.
Instrument Person - One who operates the surveying instruments.
Rod Person - One who holds the rods and assists the Instrument Person.

	07/01/2024
Party Chief	$ 50,65
Instrument Person	46.54
Rod Person	34.55
Additional $3.00/hr. for Tunnel Work	
Additional $2.50/hr. for Hazardous Work Site	

SUPPLEMENTAL BENEFITS
Per hour worked:

Journeyman	$ 29.75

OVERTIME PAY
See (B, E, P, *X) on OVERTIME PAGE
*Note: $25.10/Hr. Only for "ALL" premium hours paid when worked.

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES: 1000 hour terms based on the Percentage of Rod Persons Wage:

	07/01/2024
0-1000	60%
1001-2000	70%
2001-3000	80%

SUPPLEMENTAL BENEFIT per hour worked:

0-1000	$ 21.53 / PHP $18.45
1001-2000	24.55 / " 20.45
2001-3000	27.58/ " 22.93

NOTE: PHP is premium hours paid when worked.

12-158-545 D.H.H.

Operating Engineer - Survey Crew - Consulting Engineer 01/01/2025

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer **DISTRICT** 12

ENTIRE COUNTIES
Albany, Allegany, Broome, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Oneida, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Yates

PARTIAL COUNTIES
Dutchess: The northern portion of the county from the northern boundary line of the City of Poughkeepsie, north.
Genesee: Only the portion of the county that lies east of a line down the center of Route 98 to include all area that lies within the City of Batavia.

WAGES
These rates apply to feasibility and preliminary design surveying, line and grade surveying for inspection or supervision of construction

when performed under a Consulting Engineer Agreement.

Per hour:
SURVEY CLASSIFICATIONS:

Party Chief - One who directs a survey party.
Instrument Person - One who operates the surveying instruments.
Rod Person - One who holds the rods and assists the Instrument Person.

	07/01/2024
Party Chief	$ 50.65
Instrument Person	46.54
Rod Person	34.55

Additional $3.00/hr. for Tunnel Work.
Additional $2.50/hr. for EPA or DEC certified toxic or hazardous waste work.

SUPPLEMENTAL BENEFITS
Per hour worked:

Journeyman	$ 29.75

OVERTIME PAY
See (B, E, Q, *X) on OVERTIME PAGE
*Note: $25.10/Hr. Only for "ALL" premium hours paid when worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES: 1000 hour terms based on percentage of Rod Persons Wage:

	07/01/2024
0-1000	60%
1001-2000	70%
2001-3000	80%

SUPPLEMENTAL BENEFIT per hour worked:

0-1000	$ 21.53 / PHP $18.45
1001-2000	$ 24.55 / " 20.45
2001-3000	$ 26.98 / " 22.93

NOTE: PHP is premium hours paid when worked.

12-158-545 DCE

Operating Engineer - Survey Crew - Consulting Engineer — 01/01/2025

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES
Dutchess: That part in Duchess County lying South of the North City line of Poughkeepsie.

WAGES
Feasibility and preliminary design surveying, any line and grade surveying for inspection or supervision of construction.

Per hour: Survey Classifications	07/01/2024
Party Chief	$ 49.39
Instrument Man	40.96
Rodman	35.63

SUPPLEMENTAL BENEFITS
Per Hour:

All Crew Members:	$ 23.75

OVERTIME PAY

OVERTIME:.... See (B, E*, Q, V) ON OVERTIME PAGE.
*Double-time paid on the 9th hour on Saturday.

HOLIDAY
Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

9-15dconsult

Operating Engineer - Tunnel 01/01/2025

JOB DESCRIPTION Operating Engineer - Tunnel **DISTRICT** 7

ENTIRE COUNTIES
Albany, Allegany, Broome, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Oneida, Onondaga, Ontario, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Tioga, Tompkins, Warren, Washington, Wayne, Yates

PARTIAL COUNTIES
Dutchess: Northern part of Dutchess, to the northern boundary line of the City of Poughkeepie, then due east to Route 115 to Bedell Road, then east along Bedell Road to VanWagner Road, then north along VanWagner Road to Bower Road, then east along Bower Road to Rte. 44 east to Rte. 343, then along Rte. 343 east to the northern boundary of the Town of Dover Plains and east along the northern boundary of the Town of Dover Plains, to the borderline of the State of Connecticut.
Genesee: Only that portion of the county that lies east of a line drawn down the center of Route 98 and the entirety of the City of Batavia.

WAGES
CLASS A: Automatic Concrete Spreader (CMI Type); Automatic Fine Grader; Backhoe (except tractor mounted, rubber tired); Belt Placer (CMI Type); Blacktop Plant (automated); Cableway; Caisson Auger; Central Mix Concrete Plant (automated); Concrete Curb Machine (self-propelled slipform); Concrete Pump (8" or over); Dredge; Dual Drum Paver; Excavator; Front End Loader (4 cu. yd & over); Gradall; Head Tower (Sauerman or Equal); Hoist (shaft); Hoist (two or three Drum); Log Chipper/Loader (self-feeder); Maintenance Engineer (shaft and tunnel); any Mechanical Shaft Drill; Mine Hoist; Mining Machine(Mole and similar types); Mucking Machine or Mole; Overhead Crane (Gantry or Straddle Type); Pile Driver; Power Grader; Remote Controlled Mole or Tunnel Machine; Scraper; Shovel; Side Boom; Slip Form Paver (If a second man is needed, they shall be an Oiler); Tripper/Maintenance Engineer (shaft & tunnel); Tractor Drawn Belt-Type Loader; Tug Operator (manned rented equipment excluded); Tunnel Shovel.

CLASS B: Automated Central Mix Concrete Plant; Backhoe (topside); Backhoe (track mounted, rubber tired); Backhoe (topside); Bituminous Spreader and Mixer, Blacktop Plant (non-automated); Blast or Rotary Drill (truck or tractor mounted); Boring Machine; Cage Hoist; Central Mix Plant(non-automated); all Concrete Batching Plants; Compressors (4 or less exceeding 2,000 c.f.m. combined capacity); Concrete Pump; Crusher; Diesel Power Unit; Drill Rigs (tractor mounted); Front End Loader (under 4 cu. yd.); Grayco Epoxy Machine; Hoist (One Drum); Hoist (2 or 3 drum topside); Knuckle Boom material handler; Kolman Plant Loader & similar type Loaders (if employer requires another person to clean the screen or to maintain the equipment, they shall be an Oiler); L.C.M. Work Boat Operator; Locomotive; Maintenance Engineer (topside); Maintenance Grease Man; Mixer (for stabilized base-self-propelled); Monorail Machine; Plant Engineer; Personnel Hoist; Pump Crete; Ready Mix Concrete Plant; Refrigeration Equipment (for soil stabilization); Road Widener; Roller (all above sub-grade); Sea Mule; Shotcrete Machine; Shovel (topside); Tractor with Dozer and/or Pusher; Trencher; Tugger Hoist; Tunnel Locomotive; Vacuum Machine (mounted or towed); Welder; Winch; Winch Cat.

CLASS C: A Frame Truck; All Terrain Telescoping Material Handler; Ballast Regulator (ride-on); Compressors (4 not to exceed 2,000 c.f.m. combined capacity; or 3 or less with more than 1200 c.f.m. but not to exceed 2,000 c.f.m.); Compressors ((any size, but subject to other provisions for compressors), Dust Collectors, Generators, Pumps, Welding Machines, Light Plants (4 or any type combination)); Concrete Pavement Spreaders and Finishers; Conveyor; Drill (core); Drill (well); Electric Pump used in conjunction with Well Point System; Farm Tractor with Accessories; Fine Grade Machine; Fork Lift; Grout Pump (over 5 cu. ft.); Gunite Machine; Hammers (hydraulic-self-propelled); Hydra-Spiker (ride-on); Hydra-Blaster (water); Hydro-Blaster; Motorized Form Carrier; Post Hole Digger and Post Driver; Power Sweeper; Roller grade & fill); Scarifer (ride-on); Span-Saw (ride-on); Submersible Electric Pump (when used in lieu of well points); Tamper (ride-on); Tie-Extractor (ride-on), Tie Handler (ride-on), Tie Inserter (ride-on), Tie Spacer (ride-on); Track Liner (ride-on); Tractor with towed accessories; Vibratory Compactor; Vibro Tamp, Well Point.

CLASS D: Aggregate Plant; Cement & Bin Operator; Compressors (3 or less not to exceed 1,200 c.f.m. combined capacity); Compressors ((any size, but subject to other provisions for compressors), Dust Collectors, Generators, Pumps, Welding Machines, Light Plants (3 or less or any type or combination)); Concrete Saw (self-propelled); Form Tamper; Greaseman; Hydraulic Pump (jacking system); Junior Engineer; Light Plants; Mulching Machine; Oiler; Parapet Concrete or Pavement Grinder; Power Broom (towed); Power Heaterman (when used for production); Revinius Widener; Shell Winder; Steam Cleaner; Tractor.

Per hour:	07/01/2024	07/01/2025
CLASS A	$ 55.91	$ 58.44
CLASS B	54.69	57.22
CLASS C	51.90	54.43
CLASS D	48.89	51.42

Additional $5.00 per hour for Hazardous Waste Work on a state or federally designated hazardous waste site where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection.

CRANES:

Crane 1: All cranes, including self-erecting.
Crane 2: All Lattice Boom Cranes and all cranes with a manufacturer's rating of fifty (50) ton and over.
Crane 3: All hydraulic cranes and derricks with a manufacturer's rating of forty nine (49) ton and below, including boom trucks.

Crane 1	$ 59.91	$ 62.44
Crane 2	58.91	61.44
Crane 3	57.91	60.44

SUPPLEMENTAL BENEFITS
Per hour:

$ 25.05	$ 25.90
+ 9.85*	+ 10.10*

* This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (B, B2, E, Q, X) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
NOTE: If a holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES
WAGES:(1000) hours terms at the following percentage of Journeyworker's Class B wage.

1st term	60%
2nd term	65%
3rd term	70%
4th term	75%

SUPPLEMENTAL BENEFITS per hour: Same as Journeyworker

7-158-832TL.

Painter 01/01/2025

JOB DESCRIPTION Painter **DISTRICT** 1

ENTIRE COUNTIES
Columbia, Dutchess, Greene, Orange, Sullivan, Ulster

WAGES
Per hour

	07/01/2024	05/01/2025 Additional
Brush/Paper Hanger	$ 38.81	$ 1.99*
Dry Wall Finisher	38.81	1.99*
Lead Abatement	38.81	1.99*
Sandblaster-Painter	38.81	1.99*
Spray Rate	39.81	1.99*

(*) To be allocated at later date.

See Bridge Painting rates for the following work:
Structural Steel, all work performed on tanks, ALL BRIDGES, towers, smoke stacks, flag poles. Rate shall apply to all of said areas from the ground up.

SUPPLEMENTAL BENEFITS
Per hour

Journeyworker	$ 27.37

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour

Six (6) month terms at the following percentage of Journeyperson's wage

1st	2nd	3rd	4th	5th	6th
50%	55%	65%	75%	85%	95%

Supplemental Benefits per hour worked

1st term	$ 11.39
All others	27.37

1-155

Painter - Bridge & Structural Steel 01/01/2025

JOB DESCRIPTION Painter - Bridge & Structural Steel **DISTRICT** 8

ENTIRE COUNTIES
Albany, Bronx, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Kings, Montgomery, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES
Per Hour:
STEEL:

Bridge Painting:	07/01/2024
	$ 56.00
	+ 10.35*

ADDITIONAL $7.00 per hour for POWER TOOL/SPRAY, whether straight time or overtime.

NOTE: All premium wages are to be calculated on base rate per hour only.

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

NOTE: Generally, for Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

SHIFT WORK
When directly specified in public agency or authority contract documents for an employer to work a second shift and works the second shift with employees other than from the first shift, all employees who work the second shift will be paid 10% of the base wage shift differential in lieu of overtime for the first eight (8) hours worked after which the employees shall be paid at time and one half of the regular wage rate. When a single irregular work shift is mandated in the job specifications or by the contracting agency, wages shall be paid at time and one half for single shifts between the hours of 3pm-11pm or 11pm-7am.

SUPPLEMENTAL BENEFITS
Per Hour:
Journeyworker:

	$ 12.43
	+ 31.55*

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

OVERTIME PAY
See (B, F, R) on OVERTIME PAGE

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (4, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage - Per hour:
Apprentices: (1) year terms.

1st year	$ 22.40
	+ 4.14
2nd year	$ 33.60
	+ 6.21
3rd year	$ 44.80
	+ 8.28

Supplemental Benefits - Per hour:

1st year	$ 1.16 + 12.62
2nd year	$ 7.46 + 18.93
3rd year	$ 9.94 + 25.24

NOTE: All premium wages are to be calculated on base rate per hour only.

8-DC-9/806/155-BrSS

Painter - Line Striping — 01/01/2025

JOB DESCRIPTION Painter - Line Striping **DISTRICT** 8

ENTIRE COUNTIES
Albany, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Montgomery, Nassau, Orange, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES
Per hour:

Painter (Striping-Highway):	07/01/2024	04/01/2025	04/01/2026
Striping-Machine Operator*	$ 34.12	$ 35.49	$ 36.93
Linerman Thermoplastic	41.12	42.74	44.44

Note: * Includes but is not limited to: Positioning of cones and directing of traffic using hand held devices. Excludes the Driver/Operator of equipment used in the maintenance and protection of traffic safety.

SHIFT WORK
When directly specified in public agency or authority contract documents there shall be a 30% night shift premium pay differential for all work performed after 9:00pm and before 5:00am.

SUPPLEMENTAL BENEFITS
Per hour paid:
Journeyworker:

Striping Machine Operator:	$23.65	$ 24.30	$ 24.95
Linerman Thermoplastic:	23.65	24.30	24.95

OVERTIME PAY
See (B, B2, E2, F, S) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 20) on HOLIDAY PAGE
Overtime: See (5, 20) on HOLIDAY PAGE

REGISTERED APPRENTICES
One (1) year terms at the following wage rates:

	07/01/2024	01/01/2025	04/01/2025	04/01/2026
1st Term:	$ 16.00	$ 16.50	$ 16.50	$ 16.50
2nd Term:	20.47	20.47	21.29	22.16
3rd Term:	27.30	27.30	28.39	29.54

Supplemental Benefits per hour:

All terms:	$ 23.65	$ 23.65	$ 24.30	$ 24.95

8-1456-LS

Painter - Metal Polisher — 01/01/2025

JOB DESCRIPTION Painter - Metal Polisher **DISTRICT** 8

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

	07/01/2024
Metal Polisher	$ 39.33
Metal Polisher*	40.43
Metal Polisher**	43.33

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2024
Journeyworker:	
All classification	$ 12.79

OVERTIME PAY
See (B, E, P, T) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
One (1) year term at the following wage rates:

	07/01/2024
1st year	$ 19.67
2nd year	21.63
3rd year	23.60
1st year*	$ 22.06
2nd year*	22.07
3rd year*	24.14
1st year**	$ 22.17
2nd year**	24.13
3rd year**	26.10

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:
Per hour:

1st year	$ 8.69
2nd year	8.69
3rd year	8.69

8-8A/28A-MP

Plumber — 01/01/2025

JOB DESCRIPTION Plumber **DISTRICT** 8

ENTIRE COUNTIES
Dutchess

PARTIAL COUNTIES
Delaware: Only the Townships of Middletown and Roxbury.
Ulster: Entire county (including Wallkill and Shawangunk Prisons in Town of Shawangunk) EXCEPT for remainder of Town of Shawangunk, and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES

Per hour:	07/01/2024
Plumber & Steamfitter	$ 59.35

SHIFT WORK

SHIFT WORK:
When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker:	$ 43.61

OVERTIME PAY
See (B, E, E2, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1)year terms at the following rates:

	07/01/2024
1st year	$ 22.71
2nd year	31.32
3rd year	36.34
4th year	43.55
5th year	50.12

Supplemental Benefits per hour:

1st year	$ 18.45
2nd year	23.62
3rd year	27.42
4th year	31.72
5th year	35.00

8-21.2-SF

Plumber - HVAC / Service — 01/01/2025

JOB DESCRIPTION Plumber - HVAC / Service **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Putnam, Westchester

PARTIAL COUNTIES
Delaware: Only the townships of Middletown and Roxbury
Ulster: Entire County(including Wallkill and Shawangunk Prisons) except for remainder of Town of Shawangunk and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES
Per hour: 07/01/2024

HVAC Service	$ 43.43
	+ $ 4.47*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker HVAC Service
$ 30.39

OVERTIME PAY
See (B, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
HVAC SERVICE
(1)year terms at the following wages:

1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.

$ 19.66	$ 23.32	$ 29.05	$ 35.73	$ 38.83
+$2.43*	+$2.76*	+$3.31*	+$3.96*	+$4.21*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits per hour:

Apprentices	07/01/2024
1st term	$ 21.47
2nd term	23.05
3rd term	24.76
4th term	27.13
5th term	28.81

8-21.1&2-SF/Re/AC

Plumber - Jobbing & Alterations — 01/01/2025

JOB DESCRIPTION Plumber - Jobbing & Alterations **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Putnam, Westchester

PARTIAL COUNTIES
Ulster: Entire county (including Wallkill and Shawangunk Prisons in Town of Shawangunk) EXCEPT for remainder of Town of Shawangunk, and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES

Per hour:	07/01/2024
Journeyworker:	$ 49.63

Repairs, replacements and alteration work is any repair or replacement of a present plumbing system that does not change existing roughing or water supply lines.

SHIFT WORK
When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyworker	$ 36.44

OVERTIME PAY
See (B, *E, E2, Q, V) on OVERTIME PAGE
*When used as a make-up day, hours after 8 on Saturday shall be paid at time and one half.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 8, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year terms at the following wages:

1st year	$ 21.35
2nd year	23.73
3rd year	25.87
4th year	36.28
5th year	38.34

Supplemental Benefits per hour:

1st year	$ 12.11
2nd year	14.21
3rd year	18.38
4th year	24.86
5th year	26.96

8-21.3-J&A

Roofer — 01/01/2025

JOB DESCRIPTION Roofer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2024
Roofer/Waterproofer	$ 48.50
	+ $7.00*

* This portion is not subjected to overtime premiums.

Note: Abatement/Removal of Asbestos containing roofs and roofing material is classified as Roofer.

SUPPLEMENTAL BENEFITS
Per Hour: $ 31.87

OVERTIME PAY
See (B, H) on OVERTIME PAGE
Note: An observed holiday that falls on a Sunday will be observed the following Monday.

HOLIDAY
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year term apprentices indentured prior to 01/01/2023

1st	2nd	3rd	4th
$ 16.97	$ 24.25	$ 29.10	$ 36.37
	+ 3.50*	+ 4.20*	+ 5.26*

Supplements:

1st	2nd	3rd	4th
$ 4.10	$ 16.17	$ 19.31	$ 24.02

* This portion is not subjected to overtime premiums.

(1) year term apprentices indentured after 01/01/2023

1st	2nd	3rd	4th	5th
$ 18.43	$ 21.82	$ 24.25	$ 29.10	$ 36.37
	+ 3.16*	+ 3.50*	+ 4.20*	+ 5.26

Supplements:

1st	2nd	3rd	4th	5th
$ 7.73	$ 14.59	$ 16.17	$ 19.31	$ 24.02

* This portion is not subjected to overtime premiums.

9-8R

Sheetmetal Worker 01/01/2025

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

	07/01/2024
SheetMetal Worker	$ 49.51
	+ 3.71*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SHIFT WORK
For all NYS D.O.T. and other Governmental mandated off-shift work:
10% increase for additional shifts for a minimum of five (5) days

SUPPLEMENTAL BENEFITS
Journeyworker $ 46.20

OVERTIME PAY
OVERTIME:.. See (B, E, Q,) on OVERTIME PAGE.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 16, 23) on HOLIDAY PAGE

REGISTERED APPRENTICES

1st	2nd	3rd	4th	5th	6th	7th	8th
$ 20.20	$ 20.81	$ 23.12	$ 25.42	$ 27.74	$ 30.08	$ 32.86	$ 35.63
+ 1.48*	+ 1.67*	+ 1.86*	+ 2.04*	+ 2.23*	+ 2.41*	+ 2.60*	+ 2.78*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits per hour:

Apprentices	
1st term	$ 18.07
2nd term	22.24
3rd term	24.71
4th term	27.21
5th term	29.67
6th term	32.12
7th term	34.12
8th term	36.15

8-38

Sprinkler Fitter — 01/01/2025

JOB DESCRIPTION Sprinkler Fitter **DISTRICT** 1

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES
Per hour 07/01/2024

Sprinkler Fitter	$ 53.34

SUPPLEMENTAL BENEFITS
Per hour

Journeyworker	$ 30.77

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: When a holiday falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double time rate. When a holiday falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double time rate.

REGISTERED APPRENTICES
Wages per hour

One Half Year terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 25.89	$ 28.77	$ 31.39	$ 34.27	$ 37.14	$ 40.02	$ 42.90	$ 45.77	$ 48.65	$ 51.53

Supplemental Benefits per hour

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 9.18	$ 9.18	$ 20.90	$ 20.90	$ 21.15	$ 21.15	$ 21.15	$ 21.15	$ 21.15	$ 21.15

1-669.2

Teamster - Building / Heavy&Highway — 01/01/2025

JOB DESCRIPTION Teamster - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES
GROUP 1: LeTourneau Tractors, Double Barrel Euclids, Athney Wagons and similar equipment (except when hooked to scrapers), I-Beam and Pole Trailers, Tire Trucks, Tractor and Trailers with 5 axles and over, Articulated Back Dumps and Road Oil Distributors, Articulated Water Trucks and Fuel Trucks/Trailers, positions requiring a HAZMAT CDL endorsement.

GROUP 1A: Drivers on detachable Gooseneck Low Bed Trailers rated over 35 tons.

GROUP 2: All equipment 25 yards and up to and including 30-yard bodies and cable Dump Trailers and Powder and Dynamite Trucks.

GROUP 3: All Equipment up to and including 24-yard bodies, Mixer Trucks, Dump Crete Trucks and similar types of equipment, Fuel Trucks, Batch Trucks and all other Tractor Trailers, Hi-Rail Truck.

GROUP 4: Tri-Axles, Ten Wheelers, Grease Trucks, Tillerman, Pattern Trucks, Attenuator Trucks, Water Trucks, Bus.

GROUP 5: Straight Trucks.

GROUP 6: Pick-up Trucks for hauling materials and parts, and Escort Man over-the-road.

WAGES: (per hour)	07/01/2024
GROUP 1	$ 34.58
GROUP 1A	35.72
GROUP 2	34.02
GROUP 3	33.80
GROUP 4	33.69
GROUP 5	33.57
GROUP 6	33.57

NOTE ADDITIONAL PREMIUMS:

- Employees engaged in hazardous/toxic waste removal, on a State or Federally designated hazardous/toxic waste site, where the employee comes in contact with hazardous/toxic waste material and when personal protective equipment is required for respiratory, skin, or eye protection, the employee shall receive an additional 20% premium above the hourly wage.

SHIFT WORK

- On projects requiring an irregular shift a premium of 10% will be paid on wages. The premium will be paid for off-shift or irregular shift work when mandated by Governmental Agency.

SUPPLEMENTAL BENEFITS

Per hour:

First 40 hours	$ 44.59
Over 40 hours	36.99

OVERTIME PAY

See (*B, E, **E2, ***P, X) on OVERTIME PAGE
*Holidays worked Monday through Friday receive Double Time (2x) after 8 hours.
**Makeup day limited to the employees who were working on the site that week.
***Sunday Holidays are paid at a rate of double time and one half (2.5x) for all hours worked.

HOLIDAY

Paid: See (5, 6, 15, 25) on HOLIDAY PAGE
Overtime: See (*1) on HOLIDAY PAGE
- Any employee working two (2) days in any calendar week during which a holiday occurs shall receive a days pay for each holiday occurring during said week. This provision shall also apply if a holiday falls on a Saturday or Sunday.
*See OVERTIME PAY section for when additional premium is applicable on Holiday hours worked.

11-445B/HH

Teamster - Delivery - Building / Heavy&Highway — 01/01/2025

JOB DESCRIPTION Teamster - Delivery - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES

Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES

Group 1 Tractor Trailer Drivers
Group 2 Tri- Axle

Wages:	07/01/2024
Group 1	$ 33.70
Group 2	29.70

Hazardous/Toxic Waste Removal additional 20% when personal protective equipment is required.

SUPPLEMENTAL BENEFITS

Per hour paid:

First 40 hours	$ 32.30
Over 40 hours	0.00

OVERTIME PAY
See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 13, 15, 16, 20, 22, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 13, 15, 16, 20, 22, 25, 26) on HOLIDAY PAGE

- Employee must work either the scheduled day of work before or the scheduled day of work after the holiday in the workweek.
- Any employee working one (1) day in the calendar week during which a holiday occurs shall receive a day's pay for each holiday occurring during said week. This provision shall also apply if a holiday falls on a Saturday.
- When any of the recognized holidays occur on Sunday and are celebrated any day before or after the holiday Sunday, such days shall be considered as the holiday and paid for as such.

11-445 B/HH Delivery

Welder 01/01/2025

JOB DESCRIPTION Welder **DISTRICT** 1

ENTIRE COUNTIES
Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES
Per hour 07/01/2024

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY

HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

(AA)	Time and one half of the hourly rate after 7 and one half hours per day
(A)	Time and one half of the hourly rate after 7 hours per day
(B)	Time and one half of the hourly rate after 8 hours per day
(B1)	Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday. Double the hourly rate for all additional hours
(B2)	Time and one half of the hourly rate after 40 hours per week
(B3)	Time and one half of the hourly rate after 40 straight hours per week
(C)	Double the hourly rate after 7 hours per day
(C1)	Double the hourly rate after 7 and one half hours per day
(D)	Double the hourly rate after 8 hours per day
(D1)	Double the hourly rate after 9 hours per day
(E)	Time and one half of the hourly rate on Saturday
(E1)	Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
(E2)	Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E3)	Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
(E4)	Saturday and Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E5)	Double time after 8 hours on Saturdays
(F)	Time and one half of the hourly rate on Saturday and Sunday
(G)	Time and one half of the hourly rate on Saturday and Holidays
(H)	Time and one half of the hourly rate on Saturday, Sunday, and Holidays
(I)	Time and one half of the hourly rate on Sunday
(J)	Time and one half of the hourly rate on Sunday and Holidays
(K)	Time and one half of the hourly rate on Holidays
(L)	Double the hourly rate on Saturday
(M)	Double the hourly rate on Saturday and Sunday
(N)	Double the hourly rate on Saturday and Holidays
(O)	Double the hourly rate on Saturday, Sunday, and Holidays
(P)	Double the hourly rate on Sunday
(Q)	Double the hourly rate on Sunday and Holidays
(R)	Double the hourly rate on Holidays

(S)	Two and one half times the hourly rate for Holidays
(S1)	Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.
(T)	Triple the hourly rate for Holidays
(U)	Four times the hourly rate for Holidays
(V)	Including benefits at SAME PREMIUM as shown for overtime
(W)	Time and one half for benefits on all overtime hours.
(X)	Benefits payable on Paid Holiday at straight time. If worked, additional benefit amount will be required for worked hours. (Refer to other codes listed.)

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

(1)	None
(2)	Labor Day
(3)	Memorial Day and Labor Day
(4)	Memorial Day and July 4th
(5)	Memorial Day, July 4th, and Labor Day
(6)	New Year's, Thanksgiving, and Christmas
(7)	Lincoln's Birthday, Washington's Birthday, and Veterans Day
(8)	Good Friday
(9)	Lincoln's Birthday
(10)	Washington's Birthday
(11)	Columbus Day
(12)	Election Day
(13)	Presidential Election Day
(14)	1/2 Day on Presidential Election Day
(15)	Veterans Day
(16)	Day after Thanksgiving
(17)	July 4th
(18)	1/2 Day before Christmas
(19)	1/2 Day before New Years
(20)	Thanksgiving
(21)	New Year's Day
(22)	Christmas
(23)	Day before Christmas
(24)	Day before New Year's
(25)	Presidents' Day
(26)	Martin Luther King, Jr. Day
(27)	Memorial Day
(28)	Easter Sunday

(29) Juneteenth

New York State Department of Labor - Bureau of Public Work
State Office Building Campus
Building 12 - Room 130
Albany, New York 12226

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

As Required by Articles 8 and 9 of the NYS Labor Law

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

Submitted By: (Check Only One) ☐ Contracting Agency ☐ Architect or Engineering Firm ☐ Public Work District Office Date:

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

1. Name and complete address ☐ (Check if new or change)

Telephone Fax

E-Mail:

2. NY State Units (see Item 5).

- ☐ 01 DOT
- ☐ 02 OGS
- ☐ 03 Dormitory Authority
- ☐ 04 State University Construction Fund
- ☐ 05 Mental Hygiene Facilities Corp.
- ☐ 06 OTHER N.Y. STATE UNIT
- ☐ 07 City
- ☐ 08 Local School District
- ☐ 09 Special Local District, i.e., Fire, Sewer, Water District
- ☐ 1O Village
- ☐ 11 Town
- ☐ 12 County
- ☐ 13 Other Non-N.Y. State (Describe)

3. SEND REPLY TO ☐ (check if new or change)
Name and complete address:

Telephone Fax

E-Mail:

4. SERVICE REQUIRED. Check appropriate box and provide project information.

☐ New Schedule of Wages and Supplements.

APPROXIMATE BID DATE :

☐ Additional Occupation and/or Redetermination

PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT :

OFFICE USE ONLY

B. PROJECT PARTICULARS

5. Project Title _____

Description of Work _____

_____

Contract Identification Number _____

Note: For NYS units, the OSC Contract No. _____

6. Location of Project:
Location on Site _____

Route No/Street Address _____

Village or City _____

Town _____

County _____

7. Nature of Project - Check One:

- ☐ 1. New Building
- ☐ 2. Addition to Existing Structure
- ☐ 3. Heavy and Highway Construction (New and Repair)
- ☐ 4. New Sewer or Waterline
- ☐ 5. Other New Construction (Explain)
- ☐ 6. Other Reconstruction, Maintenance, Repair or Alteration
- ☐ 7. Demolition
- ☐ 8. Building Service Contract

8. OCCUPATION FOR PROJECT :

- ☐ Construction (Building, Heavy Highway/Sewer/Water)
- ☐ Tunnel
- ☐ Residential
- ☐ Landscape Maintenance
- ☐ Elevator maintenance
- ☐ Exterminators, Fumigators
- ☐ Fire Safety Director, NYC Only
- ☐ Fuel Delivery
- ☐ Guards, Watchmen
- ☐ Janitors, Porters, Cleaners, Elevator Operators
- ☐ Moving furniture and equipment
- ☐ Trash and refuse removal
- ☐ Window cleaners
- ☐ Other (Describe)

9. Does this project comply with the Wicks Law involving separate bidding? YES ☐ NO ☐

10. Name and Title of Requester

Signature

SEE PAGE TWO FOR LAWS RELATING TO PUBLIC WORK CONTRACTS

NEW YORK STATE DEPARTMENT OF LABOR
Bureau of Public Work - Debarment List

LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE AWARDED ANY PUBLIC WORK CONTRACT

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements;
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements.

The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = New York State Department of Labor; NYC = New York City Comptroller's Office; AG = New York State Attorney General's Office; DA = County District Attorney's Office.

Debarment Database: To search for contractors, sub-contractors and/or their successors debarred from bidding or being awarded any public work contract or subcontract under NYS Labor Law Articles 8 and 9, or under NYS Workers' Compensation Law Section 141-b, access the database at this link: https://apps.labor.ny.gov/EDList/searchPage.do

For inquiries please call 518-457-5589.

NYSDOL Bureau of Public Work Debarment List 01/06/2025

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL	*****5754	0369 CONTRACTORS, LLC		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL	*****5784	A.J.M. TRUCKING, INC.		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	DOL		AKHLAQ OULAKH		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	NYC		ALL COUNTY SEWER & DRAIN, INC.		7 GREENFIELD DR WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL	*****8387	AMERICAN PAVING & MASONRY, CORP.		8 FOREST AVE GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL	*****8654	AMERICAN PAVING, INC.		8 FORREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	NYC		AMJED PARVEZ		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL		ANGELO F COKER		2610 SOUTH SALINA STREET SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		ANGELO GARCIA		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL		ANGELO STANCO		8 FOREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL		ANGELO TONDO		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****4231	ANKER'S ELECTRIC SERVICE, INC.		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL		ANTHONY MONGELLI		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	NYC		ARADCO CONSTRUCTION CORP		115-46 132RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	DOL		ARNOLD A. PAOLINI		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
DOL	NYC		AVM CONSTRUCTION CORP		117-72 123RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	NYC		AZIDABEGUM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	*****8421	B & B DRYWALL, INC		206 WARREN AVE APT 1WHITE PLAINS NY 10603	12/14/2021	12/14/2026
DOL	DOL		B&L RENOVATION CO.		618 OCEAN PARKWAY APT A6BROOKLYN NY 11230	09/17/2020	09/17/2025
DOL	NYC	*****2113	BHW CONTRACTING, INC.		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL	*****5078	BLACK RIVER TREE REMOVAL, LLC		29807 ANDREWS ROAD BLACK RIVER NY 13032	10/17/2023	10/17/2028
DOL	DOL		BRADLEY J SCHUKA		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	DOL	*****9383	C.C. PAVING AND EXCAVATING, INC.		2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL	*****4083	C.P.D. ENTERPRISES, INC		P.O BOX 281 WALDEN NY 12586	03/03/2020	03/03/2025
DOL	DOL	*****5161	CALADRI DEVELOPMENT CORP.		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****3391	CALI ENTERPRISES, INC.		1223 PARK STREET PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****4155	CASA BUILDERS, INC.	FRIEDLANDER CONSTRUCTION	64 N PUTT CONNERS ROAD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	AG	*****7247	CENTURY CONCRETE CORP		2375 RAYNOR ST RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****0026	CHANTICLEER CONSTRUCTION LLC		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	NYC	*****2117	CHARAN ELECTRICAL ENTERPRISES		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	NYC		CHARLES ZAHRADKA		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025
DOL	DOL		CHRISTOPHER GRECO		26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL	*****2281	CORRAO TRUCKING, INC.		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL		CRAIG JOHANSEN		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027

NYSDOL Bureau of Public Work Debarment List 01/06/2025

Article 8

DOL	DOL	*****3228	CROSS-COUNTY LANDSCAPING AND TREE SERVICE, INC.	ROCKLAND TREE SERVICE	26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL ROBERT MCNALLY		7 GREENFIELD DRIVE WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL		DARIAN L COKER		2610 SOUTH SALINA ST SUITE 2CSYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		DARWIN PEGUESE		6400 BALTIMORE NATIONAL SUITE 602CANTONSVILLE NY 21228	10/24/2024	10/24/2029
DOL	DOL		DAVID FRIEDLANDER		64 NORTH PUTT CORNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL		DINA TAYLOR		64 N PUTT CONNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL	*****5175	EAGLE MECHANICAL AND GENERAL CONSTRUCTION LLC		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025
DOL	AG		EDWIN HUTZLER		23 NORTH HOWELLS RD BELLPORT NY 11713	08/04/2021	08/04/2026
DOL	DA		EDWIN HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	DOL		EMIL KISZKO		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION CORP.		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION LLC		4192 SIR ANDREW CIRCLE DOYLESTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL		EUGENIUSZ "GINO" KUCHAR		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DA		FREDERICK HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****2998	G.E.M. AMERICAN CONSTRUCTION CORP.		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	NYC		GAYATRI MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	DA		GIOVANNA TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA		GIOVANNI NAPOLITANO		2501 BAYVIEW AVENUE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DA	*****0213	GORILLA CONTRACTING GROUP, LLC		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DA	*****4760	GTX CONSTRUCTION ASSOCIATES, CORP		2501 BAYVIEW AVE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DOL		HANS RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****2397	ISLAND BREEZE MARINE, INC.		6400 BALTIMORE NATIONAL CANTONSVILLE MD 21228	10/24/2024	10/24/2029
DOL	DOL	*****9211	J. WASE CONSTRUCTION CORP.		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		J.M.J CONSTRUCTION		151 OSTRANDER AVENUE SYRACUSE NY 13205	11/21/2022	11/21/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	12/12/2022	12/12/2027

DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JAMES J. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****7993	JBS DIRT, INC.		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	*****2435	JEFFEL D. JOHNSON	JMJ7 AND SON	5553 CAIRNSTRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JEFFEL JOHNSON ELITE CARPENTER REMODEL AND CONSTRUCTION		C2 EVERGREEN CIRCLE LIVERPOOL NY 13090	11/21/2022	11/21/2027
DOL	DOL	*****2435	JEFFREY M. JOHNSON	JMJ7 AND SON	5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JIM PLAUGHER		17613 SANTE FE LINE ROAD WAYNEFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL		JMJ7 & SON CONSTRUCTION, LLC		5553 CAIRNS TRAIL LIVERPOOL NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 AND SONS CONTRACTORS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS		7014 13TH AVENUE BROOKLYN NY 11228	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS AND SONS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS, LLC		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JOHN MARKOVIC		47 MANDON TERRACE HAWTHORN NJ 07506	03/29/2021	03/29/2026
DOL	DOL		JOHN WASE		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		JORGE RAMOS		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	DOL		JOSEPH K. SALERNO		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL		JOSEPH K. SALERNO II		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		JRN CONSTRUCTION CO, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028

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DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002
DOL	DOL		KARIN MANGIN		796 PHELPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	DOL		KATE E. CONNOR		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KEAN INDUSTRIES, LLC		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL	*****2959	KELC DEVELOPMENT, INC		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KIMBERLY F. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		KMA GROUP II, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL	*****1833	KMA GROUP INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KMA INSULATION, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KRIN HEINEMANN		2345 ROUTE 52, SUITE 2N HOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	NYC		KULWANT S. DEOL		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DA	*****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	AG	*****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
DOL	DOL		LOUIS A. CALICCHIA		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****2196	MAINSTREAM SPECIALTIES, INC.		11 OLD TOWN RD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DA		MANUEL P TOBIO		150 KINGS STREET BROOKLYN NY 14444	08/19/1998	08/19/2998
DOL	DA		MANUEL TOBIO		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		MAQSOOD AHMAD		618 OCEAN PKWY BROOKLYN NY 11230	09/17/2020	09/17/2025
DOL	NYC		MARIA NUBILE		84-22 GRAND AVENUE ELMHURST NY 11373	03/10/2020	03/10/2025
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	NYC		MUHAMMED A. HASHEM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	NYC		NAMOW, INC.		84-22 GRAND AVENUE ELMHURST NY 11373	03/10/2020	03/10/2025
DOL	DOL	*****7790	NATIONAL BUILDING & RESTORATION CORP		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****1797	NATIONAL CONSTRUCTION SERVICES, INC		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	NYC		NAVIT SINGH		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		NELCO CONTRACTING, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DA		NICHOLAS T. ANALITIS		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027

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DOL	DOL	*****7429	NICOLAE I. BARBIR	BESTUCCO CONSTRUCTION, INC.	444 SCHANTZ ROAD ALLENTOWN PA 18104	09/17/2020	09/17/2025
DOL	NYC	*****5643	NYC LINE CONTRACTORS, INC.		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		PAULINE CHAHALES		935 S LAKE BLVD MAHOPAC NY 10541	03/02/2021	03/02/2026
DOL	DOL		PETER STEVENS		11 OLD TOWN ROAD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DOL		PETER STEVENS		8269 21ST ST BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL	*****0466	PRECISION BUILT FENCES, INC.		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	NYC		RASHEL CONSTRUCTION CORP		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	*****1068	RATH MECHANICAL CONTRACTORS, INC.		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	DA	*****7559	REGAL CONTRACTING INC.		24 WOODBINE AVE NORTHPORT NY 11768	10/01/2020	10/01/2025
DOL	DOL		RICHARD REGGIO		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	DOL		ROBBYE BISSESAR		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	07/11/2022	07/11/2027
DOL	DOL	*****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
DOL	DOL		SAL FRESINA MASONRY CONTRACTORS, INC.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL		SAL MASONRY CONTRACTORS, INC.		(SEE COMMENTS) SYRACUSE NY 13202	07/16/2021	07/16/2026
DOL	DOL	*****9874	SALFREE ENTERPRISES INC		P.O BOX 14 2821 GARDNER RDPOMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		SALVATORE A FRESINA A/K/A SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DOL		SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DA	*****0476	SAMCO ELECTRIC CORP.		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	NYC	*****1130	SCANA CONSTRUCTION CORP.		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025
DOL	DOL	*****2045	SCOTT DUFFIE	DUFFIE'S ELECTRIC, INC.	P.O BOX 111 CORNWALL NY 12518	03/03/2020	03/03/2025
DOL	DOL		SCOTT DUFFIE		P.O BOX 111 CORNWALL NY 12518	03/03/2020	03/03/2025
DOL	DA		SILVANO TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DOL	*****0440	SOLAR GUYS INC.		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	NYC		SOMATIE RAMSUNAHAI		115-46 132ND ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	DOL	*****2221	SOUTH BUFFALO ELECTRIC, INC.		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
DOL	NYC	*****3661	SPANIER BUILDING MAINTENANCE CORP		200 OAK DRIVE SYOSSET NY 11791	03/14/2022	03/14/2027
DOL	DOL		STANADOS KALOGELAS		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL	*****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003

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DOL	DOL	*****9528	STEEL-IT, LLC.		17613 SANTE FE LINE ROAD WAYNESFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL	*****3800	SUBURBAN RESTORATION CO. INC.		5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410	03/29/2021	03/29/2026
DOL	DOL	*****9150	SURGE INC.		8269 21ST STREET BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL		SYED MUHAMMAD S. JAFRI A/K/A SHARRUKH JAFRI		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		SYED RAZA		198 RIDGE AVENUE NY 11581	06/06/2022	06/06/2027
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL		TERRY THOMPSON		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025
DOL	DOL	*****9733	TERSAL CONSTRUCTION SERVICES INC		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13208	07/16/2021	07/16/2026
DOL	DOL		TERSAL CONTRACTORS, INC.		221 GARDNER RD P.O BOX 14POMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		TERSAL DEVELOPMENT CORP.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL	*****5766	THE COKER CORPORATION	COKER CORPORATIO N	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL	*****2426	THE MATRUKH GROUP, INC.		4307 28TH AVE PO BOX 9082ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		TIMOTHY PERCY		29807 ANDREWS ROAD BLACK RIVER NY 13612	10/17/2023	10/17/2028
DOL	DA	*****1050	TRI STATE CONSTRUCTION OF NY CORP.		50-39 175TH PLACE FRESH MEADOWS NY 11365	03/28/2022	03/28/2027
DOL	DA	*****4106	TRIPLE H CONCRETE CORP		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****6418	VALHALLA CONSTRUCTION, LLC.		796 PHLEPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	NYC	*****2426	VICKRAM MANGRU	VICK CONSTRUCTI ON	21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	NYC		VICKRAM MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DOL		VIKTORIA RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	DOL		VINCENT CORRAO		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL	*****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM G. PROERFRIEDT		85 SPRUCEWOOD ROAD WEST BABYLON NY 11704	01/19/2021	01/19/2026
DOL	DOL	*****5924	WILLIAM G. PROPHY, LLC	WGP CONTRACTIN G, INC.	54 PENTAQUIT AVE BAYSHORE NY 11706	01/19/2021	01/19/2026
DOL	DOL		WILLIAM SCRIVENS		4192 SIR ANDREW CIRCLE DOYELSTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL		XENOFON EFTHIMIADIS		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028

SECTION 01 08 00 - GENERAL COMMISSIONING REQUIREMENTS

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 SUMMARY

A. Section Includes:

1. General requirements for coordinating and scheduling commissioning.
2. Commissioning meetings.
3. Commissioning reports.
4. Test equipment, instrumentation, and tools (including, but not limited to, proprietary test equipment, instrumentation, and tools) required to perform tests.
5. Use of test equipment, instrumentation, and tools for commissioning.
6. Construction checklist requirements, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
7. Commissioning tests and commissioning test demonstration.
8. Adjusting, verifying, and documenting identified systems and assemblies.
9. Work to correct commissioning issues.
10. Work to repeat tests when equipment and systems fail acceptance criteria.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submittal procedures requirements for commissioning.

2. Section 01 77 00 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.

3. Section 01 78 23 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal.

4. Section 23 08 00 "Commissioning of HVAC" for technical commissioning requirements for HVAC systems.

5. Section 26 08 00 "Commissioning of Electrical" for technical commissioning requirements for Electrical systems.

6. Individual Technical Specifications and Drawings: Equipment and systems design and installation, startup, field quality-control testing, and additional requirements indicated in the Contract Documents.

1.3 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests and commissioning test demonstrations.

B. Commissioning Authority: An entity engaged by Owner, and identified in Section 011000 "Summary," to evaluate Commissioning-Process Work.

C. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation requirements of commissioning.

D. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities. The scope of commissioning is defined in Section 011200 "Multiple Contract Summary."

E. Construction Phase Commissioning Completion: The stage of completion and acceptance of commissioning when resolution of deficient conditions and issues discovered during commissioning and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date Construction Phase Commissioning Completion is achieved. See Section 017700 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.

1. Commissioning is complete when the work specified in this Section and related Sections has been completed and accepted, including, but not limited to, the following:

a. Completion of tests and acceptance of test results.
b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
c. Comply with requirements in Section 01 79 00 "Demonstration and Training."
d. Completion and acceptance of submittals and reports.

F. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.

G. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.

H. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

I. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s):

1. Commissioning Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate commissioning.
2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning.
3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning.
4. Appointed team members shall have the authority to act on behalf of the entity they represent.

B. Members Appointed by Owner:

1. Commissioning Authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning.

2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning.

3. Architect / Engineer, plus employees and consultants that Architect may deem appropriate for a particular portion of the commissioning.

4. Construction Manager, plus employees and consultants that Construction Manager may deem appropriate for a particular portion of the commissioning.

1.5 SUBMITTALS

A. Comply with requirements in Section 01 33 00 "Submittal Procedures" for submittal procedures general requirements for commissioning.

B. Commissioning Plan Information:

1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors to the performance of the various commissioning requirements.

2. Schedule of commissioning activities, integrated with the construction schedule. Comply with requirements in Section 01 32 00 "Construction Progress Documentation" for construction schedule general requirements for commissioning.

3. Contractor personnel and subcontractors to participate in each test.

4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.

C. Commissioning Coordinator Letter of Authority:

1. Within 10 days after approval of Commissioning Coordinator qualifications, submit a letter of authority for Commissioning Coordinator, signed by a principal of Contractor's firm. Letter shall authorize Commissioning Coordinator to do the following:

    a. Make inspections required for commissioning.
    b. Coordinate, schedule, and manage commissioning of Contractor, subcontractors, and suppliers.
    c. Obtain documentation required for commissioning from Contractor, subcontractors, and suppliers.
    d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of members of the commissioning team.

D. Commissioning Coordinator Qualification Data: For entity coordinating Contractor's commissioning activities to demonstrate their capabilities and experience.

1. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

E. Commissioning schedule.

F. Two-week look-ahead schedules.

G. List test instrumentation, equipment, and monitoring devices. Include the following information:

1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.

2. Brief description of intended use.

3. Calibration record showing the following:

    a. Calibration agency, including name and contact information.
    b. Last date of calibration.
    c. Range of values for which calibration is valid.
    d. Certification of accuracy.
    e. N.I.S.T. traceability certification for calibration equipment.
    f. Due date of the next calibration.

H. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

I. Test Reports:

1. Pre-Startup Report: Prior to start up of equipment or a system, submit signed, completed construction checklists.

2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.

3. Commissioning Issues Reports: At the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.

4. Data Trend Logs: Submit data trend logs at the end of the trend log period.

5. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit print-out of log of alarms that occurred since the last log was printed.

1.6 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction Phase Commissioning Completion, include the following:

a. Pre-startup reports.
b. Approved test procedures.
c. Test data forms, completed and signed.
d. Progress reports.
e. Commissioning issues report log.
f. Commissioning issues reports showing resolution of issues.
g. Correspondence or other documents related to resolution of issues.
h. Other reports required by commissioning.
i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction Phase Commissioning Completion.
j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction Phase Commissioning Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Commissioning Coordinator Qualifications:

1. Certification of commissioning process expertise. The following certifications are acceptable upon receipt of information demonstrating that certification is current and in good standing. Owner reserves the right to accept or reject other certifications as evidence of qualification.

a. Certified Commissioning Professional, by Building Commissioning Association.

b. Certified Building Commissioning Professional, by Association of Energy Engineers.
c. Existing Building Commissioning Professional, by Association of Energy Engineers.
d. Commissioning Process Management Professional, by American Society of Heating, Refrigerating and Air-Conditioning Engineers.
e. Accredited Commissioning Process Authority Professional, by University of Wisconsin.
f. Accredited Commissioning Process Manager, by University of Wisconsin.
g. Accredited Green Commissioning Process Provider, by University of Wisconsin.

2. Absent one of the certifications above, provide documented experience on at least three projects of similar scope and complexity commissioning systems of similar complexity to those contained in these documents. Provide written references from the lead Commissioning Authority of each project attesting to applicant experience, responsibilities, and proven capabilities in regards to commissioning being equal to those required to gain one of the listed certifications. Each reference must be certified in accordance with the above requirements.

B. Calibration Agency Qualifications: Certified by The American Association of Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

1.8 COMMISSIONING AUTHORITY'S RESPONSIBILITIES

A. Commissioning Authority Responsibilities: Comply with requirements in Section 01 12 00 "Summary of Multiple Contracts."

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Test equipment and instrumentation required to perform the commissioning shall remain the property of Contractor unless otherwise indicated.

B. Test equipment and instrumentation required to perform commissioning shall comply with the following criteria:

1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.

2. Calibrated and certified.

   a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags permanently affixed.

   b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.

3. Maintain test equipment and instrumentation.

4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.

1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Record report on compact disk.
2. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.

2. Include major tabs for each Specification Section.

3. Include minor tabs for each test.

4. Within each minor tab, include the following:

   a. Test specification.

b. Pre-startup reports.

c. Approved test procedures.

d. Test data forms, completed and signed.

e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

A. Review preliminary construction checklists and preliminary test procedures and data forms.

3.2 CONSTRUCTION CHECKLISTS

A. Construction checklists cannot modify or conflict with the Contract Documents.

B. Create construction checklists based on actual systems and equipment to be included in Project.

C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment, if applicable.

1. Services connection requirements, including configuration, size, location, and other pertinent characteristics.

2. Included optional features.

3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness and lack of damage.

D. Installation Checklists: must in general document that equipment and systems are installed and started in accordance with the contract document requirements. See attachment #1 for sample checklists for a small group of representative equipment. Develop checklists in similar format with line items required designed to insure proper installation by installers:

1. Location according to Drawings and approved Shop Drawings.

2. Configuration.

3. Compliance with manufacturers' written installation instructions.

4. Attachment to structure.

5. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.

6. Utility connections are of the correct characteristics, as applicable.

7. Correct labeling and identification.

E. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.

F. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, minimum.

G. Performance Tests:

1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

3.3 GENERAL EXECUTION REQUIREMENTS

A. Schedule and coordinate commissioning with the construction schedule.

B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.

C. Perform test demonstrations for Owner's witness. Unless otherwise indicated in specific testing requirements, demonstrate tests for 100 percent of work to which the test applies.

D. Report test data and commissioning issue resolutions.

E. Schedule personnel to participate in and perform Commissioning-Process Work.

F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:

1. Operating the equipment and systems they install during tests.

2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.4 COMMISSIONING COORDINATOR RESPONSIBILITIES

A. Management and Coordination: Manage, schedule, and coordinate commissioning, including, but not limited to, the following:

1. Coordinate with subcontractors on their commissioning responsibilities and activities.

2. Obtain, assemble, and submit commissioning documentation.

3. Attend periodic on-site commissioning meetings. Comply with requirements in Section 01 31 00 "Project Management and Coordination."

4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the construction schedule. Update schedule at specified intervals.

5. Review and comment on preliminary test procedures and data forms.

6. Report inconsistencies and issues in system operations.

7. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.

8. Direct and coordinate test demonstrations.

9. Coordinate witnessing of test demonstrations by Owner's witness.

10. Coordinate and manage training. Be present during training sessions to direct video recording, present training and direct the training presentations of others. Comply with requirements in Section 017900 "Demonstration and Training."

11. Prepare and submit specified commissioning reports.

12. Track commissioning issues until resolution and retesting is successfully completed.

13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide Owner's representative access to these records on request.

14. Assemble and submit commissioning report.

3.5 COMMISSIONING TESTING

A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.

B. Owner's witness will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published commissioning schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress, completion, and results of commissioning.

C. Construction Checklists:

1. Complete construction checklists as Work is completed.

2. Distribute construction checklists to installers before they start work.

3. Installers:

a. Verify installation using approved construction checklists as Work proceeds.
b. Complete and sign construction checklists daily for work performed during the preceding day.

4. Provide Commissioning Authority access to construction checklists.

D. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.

E. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.

F. Test Procedures and Test Data Forms:

1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.

2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.

3. Completed test data forms are the official records of the results of tests.

4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual. Test procedures will in general be designed to demonstrate that operating characteristics conform to any or all required and / or approved performance characteristics.

5. Review preliminary test procedures and test data forms and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:

   a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.

   b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.

6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."

7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.

G. Performance of Tests:

1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.

2. Perform and complete each step of the approved test procedures in the order listed.

3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.

4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.

5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

H. Performance of Test Demonstration:

1. Notify Owner's witness at least seven days in advance of each test demonstration.

2. Perform and complete each step of the approved test procedures in the order listed.

3. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.

4. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.

5. False load test requirements are specified in related sections.

    a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Architect's written approval.

I. Deferred Tests:

1. Deferred Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction Phase Commissioning Completion as follows:

    a. Identify deferred tests by number and title.
    b. Provide a target schedule for completion of deferred tests.

2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Architect and Commissioning Authority at least seven calendar days (minimum) in advance of tests.

3. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

J. Delayed Tests:

1. Delayed Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed delayed tests. Obtain Owner approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction Phase Commissioning Completion. Include the following in the request for Certificate of Construction Phase Commissioning Completion:

    a. Identify delayed tests by test number and title.
    b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.

2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Architect and Commissioning Authority at least seven calendar days (minimum) in advance of tests.

3. Where delayed tests are approved, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule delayed tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

K. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.

2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.

3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.

4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:

   a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
   b. Submit commissioning compliance issue report form within 24 hours of the test.
   c. Determine the cause of the failure.
   d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.

5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.

   a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.

   b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.

   c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.

d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.

6. Diagnose and correct failed test demonstrations as follows:

a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.
b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
c. Record the results of each step of the diagnostic procedure.
d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.
e. Determine and record corrective measures.
f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.

7. Retest:

a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.

b. For each repeated test demonstration, submit a new test data form, marked "Retest."

8. Do not correct commissioning compliance issues during test demonstrations.

a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.6 COMMISSIONING MEETINGS

A. Commissioning Authority will schedule and conduct commissioning meetings. Comply with requirements in Section 01 31 00 "Project Management and Coordination."

3.7 SEQUENCING

A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

1. Construction Checklists:

a. Material checks.

b. Installation checks.

c. Start up, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.

d. Performance Tests:

1) Static tests, as appropriate.

2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.

3) Equipment and assembly performance tests.

4) System performance tests.

5) Intersystem performance tests.

2. Commissioning tests.

B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.

C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Architect if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.

D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.8 SCHEDULING

A. Commence commissioning as early in the construction period as possible.

B. Commissioning Schedule: Integrate commissioning into Contractor's construction schedule. See Section 01 32 00 "Construction Progress Documentation."

1. Include detailed commissioning activities in monthly updated Contractor's construction schedule and short interval schedule submittals.

2. Schedule the start date and duration for the following commissioning activities:

a. Submittals.
b. Preliminary operation and maintenance manual submittals.
c. Installation checks.
d. Startup, where required.
e. Performance tests.
f. Performance test demonstrations.
g. Commissioning tests.
h. Commissioning test demonstrations.

3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.

4. Determine milestones and prerequisites for commissioning. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short interval schedule submittals.

C. Two-Week Look-Ahead Commissioning Schedule:

1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning.

2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.

3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Architect.
2. Notify Architect of commissioning schedule changes at least two work days in advance for activities requiring the participation of Owner's witness.

3.9 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:

    a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.

    b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.

    c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.

    d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.

    e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.

2. Test data reports include the following:

    a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.

    b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.

    c. Signatures of individuals performing and witnessing tests.

    d. Data trend logs accumulated overnight from the previous day of testing.

3. Commissioning Compliance Issues Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:

    a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.

    b. Action distribution list.

    c. Report date.

    d. Test number and description.

    e. Equipment identification and location.

    f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.

    g. Diagnostic procedure or plan to determine the cause (include in initial submittal).

    h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).

    i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.

    j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.

    k. Schedule for retesting.

4. Weekly progress reports include information for tests conducted since the preceding report and the following:

    a. Completed data forms.
    b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
    c. Activities scheduled but not conducted per schedule.
    d. Commissioning compliance issue report log.
    e. Schedule changes for remaining Commissioning-Process Work, if any.

5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.

    a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.

    b. Attach to the data form printed trend log data collected during the test or test demonstration.

    c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.

6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."

    a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.10 CERTIFICATE OF CONSTRUCTION PHASE COMMISSIONING COMPLETION

A. When Contractor considers that construction phase commissioning, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare and submit to Owner and Commissioning Authority through Architect a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to compete commissioning.

B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction phase commissioning or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether or not included on Contractor's list, which are not sufficiently complete as defined in "Construction Phase Commissioning Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction Phase Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction phase commissioning completion.

C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Architect's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.

D. When construction phase commissioning or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction Phase Commissioning that shall establish the date of completion of construction phase commissioning. Certificate of Construction Phase Commissioning Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 01 08 00

SECTION 01 10 00 – PROJECT SUMMARY-PROJECT SCHEDULE

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 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Construction schedule.
4. General requirements of Contract.
5. Owner-furnished products.
6. Access to site.
7. Coordination with occupants.
8. Work restrictions.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, the condition at which roofing is insulated and weathertight; exterior walls are insulated and weathertight; all openings are closed with permanent construction; and all exterior joints are sealed.

1.4 PROJECT INFORMATION

A. Project Identification: Beacon HS.

1. Project Location: Beacon High School: 99 Matteawan Road, Beacon, NY 12508.

B. Owner: Board of Education Beacon City School District.

1. Address: 10 Education Drive, Beacon, NY 12508.

C. Architect: Tetra Tech Engineers, Architects & Landscape Architects, P.C., d/b/a Tetra Tech Architects & Engineers.

1. Address: 10 Brown Road, Ithaca, NY 14850.

D. Other Owner Consultants: The Owner has retained the following who have prepared designated portions of the Contract Documents:

1. Construction Manager: Jeff West at UW Marx, Inc.

a. Address: 20 Gurley Ave., Troy, NY 12182.

b. Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and each Contractor, according to a separate contract between Owner and Construction Manager.

2. Commissioning Authority (CxA): To Be Determined.

a. Commissioning Authority will be engaged for this Project to provide commissioning services, according to provisions of Division 01 Section "General Commissioning Requirements."

b. Address: TBD

E. Project Representative: Project Representative will be appointed by Owner.

1. Project Representative will provide assistance in administering the Contract for Construction between Owner and Contractor, according to provisions of Division 01 Section, "Project Management and Coordination".

F. Building Code in Effect for Project: New York State Uniform Fire Prevention and Building Code and the Energy Conservation Construction Code of New York State.

1. Comply with the following: Building standards of the New York State Education Department.

1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
This project includes renovation of approximately 3,752 sf of mechanical space on the first floor of beacon high school. Existing exterior chillers, interior boilers, and pumps are at the end of their useful life. These will be replaced with new air-cooled chillers, high efficiency boilers, pumps, and associated piping and electrical feeds. Exterior buried piping to be disconnected and abandoned in place. Existing fencing and exterior structural concrete slab to be extended to support new larger chillers.

B. Type of Contract: Project will be competitively bid under Mechanical and Electrical Prime contracts

1. **Mechanical Contract to include all work shown on drawings and specifications with the exception of:**

a. All electrical work 120 volts and above, which will be performed by the Electrical Contract and

b. DDC Control work which will be "by others" as noted in specification section 23 09 00.

c. This contract work includes the exterior yard work (i.e. fencing and concrete pad extensions).

2. Electrical Contract to provide :

a. All Specification Division 1 requirements as applicable

b. All 120 volt and higher work noted

c. All electrical removals noted

d. All conduits and pathway removals and installations etc.

1.6 CONSTRUCTION SCHEDULE

A. The Work shall be conducted in accordance with the following schedule:
1. Commencement of Construction (Off-Site Activities): Immediately following Contract Award.
2. Commencement of Construction (On-Site): Chiller work October 20, 2025.
3. Commencement of Construction (On-Site): Boiler work – Start selective demo start May 4, 2026, boiler(s) must remain operational until May 29, 2026.
4. Submittals: Provide all submittals within 30 days after award of contract.
5. Substantial Completion date: Chiller May 5, 2026.
6. Substantial Completion date: Boiler October 1, 2026
7. Final completion date: 30 days after Substantial Completion.

8. The Work shall be conducted simultaneously.
9. Key mechanical dates:
    a. Preconstruction balance report: Due before demo starts May 4, 2026.
    b. Complete balance requirements: November 1, 2026.
10. Final balance reports approval: November 30, 2026.

1.7 GENERAL REQUIREMENTS OF CONTRACT

A. Temporary HVAC: The Contractor is responsible for temporary HVAC before permanent enclosure of building is complete and all associated costs. The Contractor is responsible for temporary HVAC after permanent enclosure of building is complete, but Owner will pay utility-use charges.

1. Use of permanent systems for temporary HVAC is prohibited.

B. Temporary Ventilation: The Contractor is responsible for temporary ventilation before permanent enclosure of building is complete and all associated costs. The Contractor is responsible for temporary ventilation after permanent enclosure of building is complete, but Owner will pay utility-use charges.

1. Use of permanent systems for temporary ventilation is prohibited.

C. Water Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

D. Electric Power Service from Permanent Existing System: Electric power from permanent existing system is available for use. Provide metering, connections and extensions of services as required for construction operations. Separate metering for field offices from that for other construction purposes.

1. Construction Use Charges: Arrange for electric power service use charges for construction purposes to be billed directly from power company to Owner.

2. Field Office Use Charges: Pay electric power service use charges for electricity used for construction field offices (one for Contractor, one for Owner's Project Representative).

    a. Maximum one 100 A, 240 V, single-phase connection per construction field office. Assume a diversified peak connected load factor of 12 kW.

1.8 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Contractor's Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products.

B. Owner-Furnished Products under State Contract:

1. Temperature Controls Contractor (TCC), Section 23 09 00 Instrumentation and Control for HVAC – Day Automation Systems, Incorporated, using NYS OGS contract pricing,

through NYS OGS Group # 77201, Award # 23150, Contract # PT68783 for Products and Installation.

a. Temperature Controls Contractor is responsible for all electrical connections to provide for a complete and operating system.

b. Mechanical contractor responsible for the work shall coordinate the work with the owner's Temperature Controls Contractor.

c. Temperature Controls Contractor (TCC) shall furnish the following to the Mechanical Contractor for installation.

1) Loose dampers associated with louvers, exhaust fans, and gravity hoods.
2) Control valves.
3) Sensor wells to fit their sensors.

d. Exception: actuated devices or sensors that must be an integral part of the equipment (example: factory installed mixing box dampers or internal packaged refrigeration system safety controls) shall be provided by Mechanical Contractor responsible for the Work.

1.9 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.10 COORDINATION WITH OCCUPANTS

A. Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Project Representative and approval of authorities having jurisdiction.

2. Maintain in operation all life safety provisions and devices (including, but not limited to, fire alarms, fire extinguishers, smoke detectors, heat sensors, emergency and exit lighting, defibrillators, and similar items).

3. Notify Project Representative not less than 72 hours in advance of activities that will affect Owner's operations.

B. Coordination with School Schedule:

1. Normal School Year: Owner intends to maintain a full educational program during the normal school year throughout duration of Project, and will make full use of the building and site, unless noted otherwise.

a. School and special activities may be conducted within building and on site outside regular school hours, including holidays and weekends.

b. Owner's personnel will perform normal custodial and maintenance services for the building areas and systems not involved in construction activities, unless noted otherwise.

2. Summer: Owner may schedule a summer school program or organized recreation activities at the building or site.

a. Owner will staff building, at a minimum, with administrative, custodial and maintenance personnel during summer period.

C. Identification: The Contractor shall require its personnel and those of its subcontractors, sub-subcontractors and suppliers to wear yellow safety vests and visible photo-identification badges acceptable to the Owner, at all times for identification and security purposes.

1.11 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to normal business working hours of 7:00 a.m. to 4:00 pm p.m., Monday through Friday, except as otherwise indicated. Movement of materials is not permitted in Owner-occupied areas during normal business working hours.

1. Other Weekday Hours: When approved by CM and Owner
2. Weekend Hours: When approved by CM and Owner.
3. Hours for Noisy Activity (in excess of 60 dB): During non school hours as approved by CM and Owner.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Project Representative not less than 72 hours in advance of proposed utility interruptions.
2. Obtain Project Representative's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Project Representative not less than 72 hours in advance of proposed disruptive operations.
2. Obtain Project Representative's written permission before proceeding with disruptive operations.

E. Indoor Air Quality (IAQ): Protect indoor air quality, including control of emissions and moisture control during construction. Develop a construction IAQ management plan to be followed.

1. Control of Emissions: Provide measures and conduct operations to:

   a. Protect HVAC systems.

   b. Protect against emissions from such sources as environmental tobacco smoke, combustion contaminants, biological contaminants, volatile organic compounds (VOCs), formaldehyde, soil gases, pesticides, particles and fibers.

   c. Provide low- and zero-VOC materials.

   d. Protect against dust infiltration, especially during dust-producing activities.

   e. Isolate work areas to prevent contamination of clean or occupied spaces.

   f. Continuously maintain and regularly inspect areas and IAQ measures to prevent contamination of building areas.

   g. Provide adequate ventilation, including, but not limited to:

1) Minimum 48-hour pre-ventilation of packaged dry products which have odors or VOC emissions, prior to installation. Condition products without containers and packaging to maximize off-gassing of VOCs off-site.

2) Adequate ventilation during and after installation of interior wet products and interior final finishes, and

3) Appropriate air filtration, including filter replacement.

h. Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible.

i. Vacuum carpeted and soft surfaces with a high-efficiency particulate arrestor (HEPA) vacuum.

j. Flush out building for a minimum of 72 hours, or longer if required to dissipate emissions, prior to occupancy.

2. Moisture Control: Provide measures and conduct operations to:

a. Provide proper housekeeping to keep materials dry.
b. Inspect areas and materials for dampness and mold growth.
c. Schedule construction operations so that absorptive materials are protected and weather-proof building as quickly as possible.
d. Test for moisture content, moisture penetration and microbial growth to maintain within permissible limits.

F. Comply with requirements in Division 01 Section “Governmental Safety Requirements”.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 21 00 - ALLOWANCES

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 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:
   1. Contingency allowances.

1.3 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances.

1.4 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work.

1.6 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes.

B. Allowance shall include cost to Contractor of specific products and materials under allowance and shall include taxes, freight, and delivery to Project site. Contractor's costs for receiving and handling at Project site, labor, installation, and similar costs related to products and materials under allowance shall be included as part of the allowance.

C. Contractor's Overhead and profit related to the allowance shall be included as part of the Contract Sum and not part of the allowance, however subcontractor Overhead and profit may be part of allowance.

1.7 ALLOWANCE PROCEDURES

A. Authorization for use of allowances is documented through Allowance Access Authorization form provided in the Project Manual, accompanied by substantiating data.

B. At Project closeout, unused amounts remaining in the allowances will be credited to Owner by Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.2 SCHEDULE OF ALLOWANCES **MECHANICAL CONTRACT**

A. Allowance No. 1: Contingency Allowance: Include the sum of $75,000.00 for use according to Owner's instructions.

3.3 SCHEDULE OF ALLOWANCES - **ELECTRICAL CONTRACT**

3.4 Allowance No. 1: Contingency Allowance: Include the sum of $20,000.00 for use according to Owner's instructions.

Attachment: Allowance Access Authorization

END OF SECTION 01 21 00

ALLOWANCE ACCESS AUTHORIZATION:

Project: RECONSTRUCTION TO BEACON HS

Architect: Tetra Tech Architects & Engineers **Project No. 279180-24002.1**

Contractor:

AAA No.: **Initiation Date:**

The Allowance is allocated as follows:

Total original Contract Allowance was:	$
Amount of Contract Allowance Access previously authorized:	$
Adjusted Contract Allowance prior to this authorization is:	$
The amount of available Allowance will Decrease by this Access Authorization:	$
The remaining Contract Allowance, after this Access Authorization will be:	$

Recommended by:
Architect

By (Signature): _____

Date: _____

Recommended by:
Construction Manager [if applicable]

By (Signature): _____

Date: _____

Accepted by:
Contractor

By (Signature): _____

Date: _____

Approved by:
Owner

By (Signature): _____

Date: _____

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

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 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor,

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use the “Request for Substitution” form attached to this Specification Section. Complete all sections of the form.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Information to support identification of the proposed substitution as “for Cause” or “for Convenience.”

b. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

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

d. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

e. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

f. Samples, where applicable or requested.

g. Certificates and qualification data, where applicable or requested.

h. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

i. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

j. Evidence of compliance with building code in effect for Project.

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

l. Cost information, including a proposal of change, if any, in the Contract Sum.

m. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

n. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation. Such additional information or documentation may include detailed side-by-side comparison charts of the specified product and the proposed substitution, and other data. Only one substitution request for each product will be considered. Architect will make final determination as to whether the substitution is “for Cause” or “for Convenience”.

   a. Architect will notify Contractor and Construction Manager of acceptance or rejection of proposed substitution.

b. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.

d. Requested substitution is compatible with other portions of the Work.

e. Requested substitution has been coordinated with other portions of the Work.

f. Requested substitution provides specified warranty.

g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 15 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

    b. Requested substitution does not require extensive revisions to the Contract Documents.

    c. Requested substitution is consistent with the Contract Documents and will produce indicated results.

    d. Substitution request is fully documented and properly submitted.

    e. Requested substitution will not adversely affect Contractor's construction schedule.

    f. Requested substitution is compatible with other portions of the Work.

    g. Requested substitution has been coordinated with other portions of the Work.

    h. Requested substitution provides specified warranty.

    i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

Attachment: Request for Substitution Form

END OF SECTION 01 25 00

TETRA TECH
ARCHITECTS & ENGINEERS

Request for Substitution

This form must be completely filled in with all relevant data by the Prime Contractor and submitted to the Architect in accordance with Project Manual Requirements for consideration before any request to change the drawing or specification requirements will be considered.

REFERENCE DATA

Project name:_____ Date of Request:_____

Location:_____ Architect's Project No:_____

Request by Contractor:_____

Address:_____

Contact person:_____ Phone:_____ Email:_____

SUBSTITUTION REQUEST DATA

(Provide statement indicating why specified product, fabrication or installation cannot be provided.)

SUBSTITUTION REQUESTED IS FOR:

☐ Named product.

☐ Product type, material, finish or formulation.

☐ Fabrication or installation methods.

Reason for request:_____

Note whether substitution is for cause or convenience:_____

PRODUCT / MATERIAL / METHOD FOR WHICH SUBSTITUTION IS REQUESTED IS SHOWN ON THE FOLLOWING DOCUMENTS:

Specification: Section No:_____ Page(s):_____ Paragraph/Item No.:_____

Drawings: (List No's of all Drawings affected):_____

DETAILED COMPARISON

Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

COST/BENEFIT ANALYSIS

Describe in detail any alteration to any other part of the Works required by use of the requested substitution, including work by other Prime Contractors:

If applicable total net cost of any such other project required alterations, including overhead and profit: $_____
(Indicate if cost is an "Add" or "Deduct" to contract sum.

Benefits to Owner other than financial:_____

Schedule impact (Note any impact on project schedule by proposed substitution):_____

ADDITIONAL INFORMATION REQUIRED

PRIME CONTRACTOR TO PROVIDE ADDITIONAL INFORMATION AS NECESSARY AND ATTACH THE FOLLOWING INFORMATION:

1. Manufacturer's technical data sheets on proposed products, including test results as applicable.
2. Manufacturer's standard form of warranty.
3. Letter on manufacturer's letterhead stating that manufacturer will warrant products as specified, if specification requires specific warranties not included in manufacturer's standard form of warranty.
4. Letter(s) from other Prime Contractor(s) responsible for works affected by proposed substitution which state the total cost(s) of all such work, if any alteration of other work is required. Prime Contractor submitting this Request for Substitution will be responsible to fully reimburse the Owner for all such additional costs; processed via a deduct Change Order.

CONTRACTOR'S CERTIFICATION

1. BY SUBMISSION OF THIS SUBSTITUTION REQUEST AND PER SIGNATURE BELOW, CONTRACTOR CERTIFIES THIS SUBSTITUTION REQUEST HAS BEEN REVIEWED AND APPROVED BY THE CONTRACTOR IN ACCORDANCE WITH THE PROJECT MANUAL REQUIREMENTS.
2. BY SUBMISSION OF THIS SUBSTITUTION REQUEST AND PER SIGNATURE BELOW CONTRACTOR CERTIFIES THE PROPOSED SUBSTITUTION COMPLIES WITH ALL APPLICABLE REQUIREMENTS OF THE CONTRACT DOCUMENTS AND REFERENCED CODES AND STANDARDS.
3. BY SUBMISSION OF THIS SUBSTITUTION REQUEST AND PER SIGNATURE BELOW CONTRACTOR HEREBY WAIVES ALL RIGHTS TO ADDITIONAL COMPENSATION OR TIME THAT MAY SUBSEQUENTLY BECOME NECESSARY BECAUSE OF FAILURE OF PROPOSED MATERIAL TO PRODUCE THE INDICATED AND REQUIRED RESULTS.

Name of Authorized Contractor Representative: _____

Signature of Authorized Contractor Representative: _____

Name of Contractor_____

Date_____

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

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 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, via the electronic form procedures outlined in Division 01 Section “Project Management and Coordination” and during the preconstruction conference.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time, via the electronic form procedures outlined in Division 01 Section “Project Management and Coordination” and during preconstruction conference. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

2. Unless otherwise noted, within 14 days after receipt of Proposal Request, submit a quotation listing adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

    c. Include costs of labor and supervision directly attributable to the change.

d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Quotation Form: Use forms acceptable to Architect.

f. If contractor fails to provide all information as noted above, Architect will return the submitted quotation noting the corrections required. If subsequent quotation submittal by the Contractor fails to comply with the format and protocols outlined above, the Owner is entitled for reimbursement from the Contractor for amounts paid to the Architect for review of additional quotation submissions.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may submit a request for a change to the Architect through Construction Manager.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

7. Proposal Request Form: Use form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request response, Architect will issue a Change Order for signatures of Owner, Architect, Construction Manager and Contractor.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

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 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

B. AIA Document: Current, authorized editions of standard forms issued by the American Institute of Architects (AIA).

1. Where AIA Documents are identified in this Section, the use of facsimiles of AIA documents or non-AIA documents is prohibited.

1.4 SCHEDULE OF VALUES

A. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than **fourteen** days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content:

1. Use AIA Document G703 as form for schedule of values, with entries typewritten.

a. Subschedules for Separate Elements of Work: Provide subschedules **for each building**.

1) List allowances on subschedules only where exclusively part of separate element of work.

b. Summary Schedule: Provide summary schedule listing each subschedule and its total and each allowance; total of all subschedules and allowances shall equal the Contract Sum.

2. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Architect's project number.
    c. Contractor's name and address.
    d. Date of submittal.

3. Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide line item(s) for each Specification Section.

4. Arrange the schedule of values to indicate the following for each item listed, completing columns A, B and C of AIA Document G703:

    a. Column A: Indicate Specification Section number.
    b. Column B: Indicate Specification Section title, and provide separate line items for labor and materials.
    c. Column C: Provide separate line item dollar values for labor and materials. Round amounts to nearest whole dollar.

5. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment. In addition to line items for each applicable specification section, include the following:

    a. Multiple line items for amounts in excess of five percent of Contract Sum, broken out to subcomponents equaling not greater than five percent each.

    b. Project Startup:

        1) Include separate line items for project startup requirements, including the following separate line items:

            a) Insurance, based on actual invoice amount.
            b) Performance and payment bonds, based on actual invoice amount.
            c) Mobilization.
            d) Temporary facilities and controls.

    c. Allowances: Provide a separate line item in the summary schedule of values for each allowance.

    d. Submittals – Include a minimum of **One** percent of contract sum.

    e. Supervision: Include a minimum of **Three** percent of contract sum.

    f. Meetings: Provide a separate line item in the schedule of values for Contractor attendance at meetings. Include a minimum of **One** percentage of contract sum.

    g. Punch List – **Three** percent of contract sum.

h. Project Closeout:

1) Include separate line items for project closeout requirements, as follows:

a) Demobilization.
b) Warranties.
c) Final cleaning.
d) Operation and maintenance manuals.
e) Project record documents.
f) Demonstration and training.

2) The total value of all project closeout line items shall equal to not less than the following:

a) General Contract: **One** percent of the Contract Sum.

6. Each item in the schedule of values shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications as certified by Architect and Construction Manager.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

1. Submit draft copy of Application for Payment **seven** days prior to due date for review by Construction Manager.

C. Application for Payment Forms: Use **AIA Document G702/CMa and AIA Document G703** as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.

1. Entries shall match data on the schedule of values.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received.
3. Include amounts of fully-executed Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Enter in column F (Materials Presently Stored) of AIA Document G703 the value of materials presently stored for which payment is sought. Recalculate the total of the column at the end of each pay period. This value covers both materials newly stored for which payment is sought and materials previously stored which are not yet incorporated into the Project. Payment by the Owner for stored materials does not result in a deduction from this column. Only as materials are incorporated into the Project is their value deducted from this column and incorporated into column E (Work Completed--This Period.).

2. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

3. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Construction Manager.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule.
4. Certificates of insurance and insurance policies.
5. Performance and payment bonds.

H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited to, two originals and two copies each of the following:

1. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
2. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
3. AIA Document G707, "Consent of Surety to Final Payment."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

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 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Digital data files.
3. Owner's Project Representative activities.
4. Electronic form procedures.
5. Requests for Information (RFIs).
6. Project meetings.

1.3 COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation. **Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work.**

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.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. 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. Installation and removal of temporary facilities and controls.
3. Project meetings.
4. Project closeout activities.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.4 DIGITAL DATA FILES

A. Architect's Digital Data Files: Upon request, and at Architect's sole discretion, electronic copies of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.

1. Architect may furnish Contractor digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.

a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

b. Format: The Contract Drawings may be available in AutoCAD and .pdf formats.

1) Architect's charge for drawings in AutoCAD format: $50 per drawing.
2) Architect's charge for drawings in .pdf format: $50 per request.

c. Contractor shall fill out and submit a Request for Electronic Drawing Files form included in Project Manual for any drawing files.

d. Contractor shall also execute a Terms of Electronic File Transfer (TOFT) included in Project Manual for any drawing files furnished in AutoCAD format.

e. The following drawings may be furnished for the appropriate discipline:

1) Site base file drawings.
2) Floor plans.
3) Reflected ceiling plans.

1.5 PHOTOS

A. Photos submitted by the Contractor for any purpose related to the project must be submitted in JPEG format.

1.6 OWNER'S PROJECT REPRESENTATIVE ACTIVITIES

A. Project Representative shall:

1. Serve as liaison between Architect, Contractors and Owner.

2. Perform on-site observations of the progress and quality of the Work as may be reasonably necessary to assist the Architect determine, in general, if the Work is being performed in a manner indicating that the Work when completed will be in conformance with the Contract Documents. Notify the Architect if, in the Project Representative's

opinion, Work does not conform to the Contract Documents or requires special inspection or testing.

3. Monitor the Contractor's construction schedules on an ongoing basis and alert the Architect to conditions that may lead to delays in completion of the Work.

4. Coordinate shared access to work areas.

5. Coordinate and issue written approvals for acceptable interruptions of utilities and potentially disruptive activities.

6. Receive and review suggestions proposed by the Contractor, and submit them, together with recommendations, to the Architect.

7. Attend all meetings and report to the Architect on the proceedings.

8. Notify Architect when tests required by the Contract Documents and inspections by authorities having jurisdiction will be performed. Observe tests required by the Contract Documents and inspections by authorities having jurisdiction. Record and report to the Architect on test procedures, inspections, and results. Verify testing is performed in accordance with specified requirements and at appropriate times.

9. Maintain records at the construction site in an orderly manner, including correspondence, Contract Documents, Change Orders, Construction Change Directives, reports of meetings, Shop Drawings, Product Data and similar submittals; supplementary drawings, color schedules and requests for payment; and names, addresses telephone numbers, and email addresses of the Contractors, Subcontractors and principal material suppliers.

10. Maintain a daily log of activities at the site, including weather conditions, nature and location of Work being performed, verbal instructions and interpretations given to the Contractor, 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 time and purpose of their visit.

11. Notify the Architect if any portion of the Work requiring Shop Drawings, Product Data or Samples is commenced before such submittals have been approved by the Architect. Receive and log Samples required at the site, notify the Architect when they are ready for examination, record the Architect’s action and maintain custody of approved Samples.

12. Review the Contractor's record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications at intervals appropriate to the stage of construction and notify the Architect of any apparent failure by the Contractor to maintain up-to-date records.

13. Review Applications for Payment and forward to the Architect with recommendations for disposition.

14. Assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion.

15. Assist the Architect in receipt and transmittal to the Owner of documentation required of the Contractor at completion of the Work.

B. Project Representative shall not:

1. Authorize deviations from the Contract Documents.

2. Approve submittals or substitute materials or equipment.

3. Personally conduct or participate in tests or third party inspections.

4. Assume any of the responsibilities of the Contractor's superintendent or of Subcontractors.

5. Expedite the Work for the Contractor.

6. Have control over or charge of or be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work.

7. Authorize or suggest that the Owner occupy the Project in whole or in part.

1.7 ELECTRONIC FORM PROCEDURES

A. Use Submittal Exchange for the following processes:

1. Submittals, refer to Division 01 “Submittal Procedures”.
2. Request for Information (RFI).
3. Architect’s Supplemental Instruction (ASI), refer to Division 01 Section “Contract Modification Procedures”.
4. Proposal Request (PR), refer to Division 01 Section “Contract Modification Procedures”.
5. Change Order (CO), refer to Division 01 Section “Contract Modification Procedures”.
6. Contractor Quotes, refer to Division 01 Section “Contract Modification Procedures”.
7. Allowance Access Authorization (AAA), refer to Division 01 Section “Contract Modification Procedures
8. Payment Applications, refer to Division 01 Section “Payment Procedures”.
9. Inspection Reports.

B. Contractor and other parties granted access by the Architect to Submittal Exchange shall follow instructions issued by the Architect during the preconstruction conference.

1.8 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified, via the electronic form procedures outlined.

1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of others.

B. Content of the RFI: Include a detailed description of item needing information or interpretation and the following:

1. Project number.

2. RFI number.

3. Contract number and title.

4. Name of Contractor.

5. Name of Contractor’s contact person.

6. Email address of Contractor’s contact person.

7. RFI subject.

8. Question: Fully describe question or information requested. Include:

   a. Specification Section number and title and related paragraphs, as appropriate.
   b. Drawing number and detail references, as appropriate.
   c. Field dimensions and conditions, as appropriate.
   d. Contractor's suggested resolution. If Contractor's solution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

9. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

   a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow reasonable time for Architect's response for each RFI.

1. The following RFIs will be returned without action:

   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Architect's actions on submittals.
   f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within seven days of receipt of the RFI response.

D. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

E. Electronic RFI Log: Architect will maintain a tabular log of RFIs organized by RFI number.

1.9 PROJECT MEETINGS

A. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, Construction Manager and Architect, but no later than 15 days after date of Notice of Award.

1. Attendees: Authorized representatives of Owner**,** Commissioning Authority, Construction Manager, Architect, and their consultants; Contractor and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Designation of key personnel and their duties.
b. Lines of communications.
c. Bonds and insurance.
d. Subcontract list.
e. Schedule of values.
f. Payment request estimate.
g. Applications for Payment.
h. Contractor’s construction schedule.
i. Submittals.
j. Electronic form procedures (RFIs, ASIs, PRs).
k. Procedures for processing Change Orders and Construction Change Directives.
l. Quality control.
m. Adjoining properties.
n. Project schedule.
o. Contractor review of Contract Documents, including Drawings and Specifications.
p. Project meetings.
q. Project closeout procedures.
r. Electronic drawings.
s. AIA and Word documents.

3. Report: Construction Manager will prepare and distribute meeting report.

B. Site Preconstruction Conference: Construction Manager will schedule and conduct a site preconstruction conference, at a time convenient to Owner, Construction Manager and Architect.

1. Attendees: Authorized representatives of Owner, Owner's testing agency, Construction Manager, Architect, and their consultants; Geotechnical Engineer of Record; Contractor and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance, including the following:

    a. Designation of key personnel and their duties.
    b. Lines of communication.
    c. Electronic form procedures (RFIs, ASIs, PRs).
    d. Submittal procedures.
    e. Subcontracts.
    f. Construction schedule.
    g. Temporary facilities and controls.
    h. Use of premises.
    i. Permits.
    j. Soil erosion and sediment control.
    k. Tree protection.
    l. Procedures for testing and inspecting.
    m. Roles and responsibilities of each party.
    n. Topsoil.
    o. Seeding/sodding.
    p. Concrete.
    q. Staging removal.

3. Report: Construction Manager will prepare and distribute meeting report.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Review each Specification Section for requirements for preinstallation conferences.

    a. No later than 15 days after date of Notice of Award, submit to Architect complete listing of preinstallation conferences to be held.

2. 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, Construction Manager, Commissioning Authority and Project Representative of scheduled meeting dates.

3. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Deliveries.
    c. Submittals.
    d. Review of mockups.
    e. Time schedules.
    f. Weather limitations.

g. Manufacturer's written instructions.
h. Warranty requirements.
i. Compatibility of materials.
j. Acceptability of substrates.
k. Temporary facilities and controls.
l. Space and access limitations.
m. Testing and inspecting requirements.
n. Installation procedures.
o. Coordination with other work.
p. Required performance results.
q. Protection of adjacent work.

4. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

5. Reporting: Distribute report of the meeting to each party present and to other parties requiring information.

6. 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: Construction Manager will conduct progress meetings at biweekly intervals, unless otherwise necessitated.

1. Attendees: In addition to representatives of Owner, Commissioning Authority, 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 meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review report of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Review present and future needs of each entity present, including the following:

1) Report of progress since previous meeting.

2) Architect/Engineer discussion items.

3) Status of ASIs, PRs, Change Orders.

4) Status of submittals.

5) 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.

a) Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b) Review schedule for next period.

6) Date of Substantial Completion.

7) Status of RFIs.

8) Owner discussion items.

9) Discussion items for each Contract.

10) General and administrative items, including such items as:

a) Project documentation.
b) Prohibitions.
c) Identification cards.
d) Separation.
e) Egress.
f) Conservation.

3. Report: Construction Manager will prepare and distribute the meeting report to each party present and to parties requiring information.

E. Health and Safety Committee Meetings: Owner will conduct health and safety committee meetings as needed, in accordance with requirements of Regulations of the Commissioner of Education, Part 155 (8 NYCRR 155), Section 155.5(c)(2).

1. Attendees: In addition to representatives of the Owner and Construction Manager, each contractor shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance, including the following:

a. Health and safety matters related to the construction project.

3. Report: Owner will prepare and distribute meeting report to each party present and to parties requiring information.

F. Project Closeout Conference: Construction Manager will schedule and conduct a project closeout conference, at a time convenient to Owner, Construction Manager and Architect, but no later than 90 days prior to each final scheduled date of Substantial Completion.

1. Attendees: Authorized representatives of Owner, Commissioning Authority, Construction Manager, Architect, and their consultants; Contractor and its superintendent; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.
f. Requirements for demonstration and training.
g. Owner's occupancy requirements.
h. Responsibility for removing temporary facilities and controls.

3. Report: Construction Manager will prepare and distribute meeting report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

Attachment: Request for Electronic Drawing Files
Terms of Electronic File Transfer (TOFT)

END OF SECTION 01 31 00

TETRA TECH
ARCHITECTS & ENGINEERS

Cornell Business + Technology Park
10 Brown Road
Ithaca, New York 14850
Tel. (607) 277-7100
Fax (607) 277-1410

Request for Electronic Drawing Files – Business Office

Prime Contractor Name:

Prime Contractor Address:

Contact to Receive Invoice:

Project Name:

Project Number:

Project Manager:

Drawing Type: Some drawings may be only available as a PDF file and may NOT be available as an AutoCAD file.

☐ PDF Files ($50 per request) ☐ AutoCAD type files ($50 per file)

For PDF files:

List each Drawing # Requested – If requesting entire set note "All".

For AutoCAD files:

Number of drawing files

List each Drawing # Requested

Contractor Signature _____

TETRA TECH
ARCHITECTS & ENGINEERS

Cornell Business + Technology Park
10 Brown Road
Ithaca, New York 14850
Tel. (607) 277-7100
Fax (607) 277-1410

Terms of Electronic File Transfer (TOFT)

The purpose of this document is to establish the terms of use and liability related to the electronic transfer of files from Tetra Tech Engineers, Architects & Landscape Architects, P.C. d/b/a Tetra Tech Architects & Engineers (hereinafter "Tetra Tech") to the Recipient (designated below). This Agreement covers all electronic files transmitted to the Recipient, associated with the Project(s) listed below, that are not otherwise covered by a contractual agreement to provide such files.

Project(s) & Project #s: _____

_____

Recipient of Electronic Files:

Company Name: _____

Company Address: _____

_____

Terms of Electronic File Transfer:

1. The electronic files (Files) furnished by Tetra Tech to the person or entity receiving the Files (Recipient) are provided only for the convenience of the Recipient, and only for its sole use. RECIPIENT AGREES THAT, BY OPENING THE PACKAGE CONTAINING THE FILES, RECIPIENT SHALL BE BOUND BY AND SUBJECT TO THE TERMS OF THIS DISCLAIMER.

2. Recipient recognizes that the Files may not be adequate or appropriate for Recipient's needs. In the case of any defects in the Files or any discrepancies between the Files and the hardcopy of the Files bearing the seal of Tetra Tech's professional registrant (if applicable), the sealed hardcopy shall govern. Recipient accepts the Files on an "as-is" basis, with any and all faults. There are no express warranties made by Tetra Tech with respect to the Files, and any implied warranties are excluded.

3. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED. Tetra Tech assumes no responsibility for the accuracy or completeness of the Files, and any use or reuse of such electronic data for any purpose shall be at the Recipient's sole risk.

4. Furthermore, in consideration of the use of the electronic data and the Files, Recipient agrees, to the fullest extent permitted by law, to defend (by legal counsel selected by Tetra Tech), indemnify, and hold Tetra Tech harmless from any and all claims, damages, losses, costs, and expenses, including attorney's fees and court costs (including the costs of any appeals) arising out of or resulting from Recipient's use, reuse, or use by others, regardless of whether such claims, damages, losses, costs, and expenses are caused in whole or in part by Tetra Tech. The duty to defend, indemnify, and hold Tetra Tech harmless shall apply regardless of whether such claims, damages, losses, costs, and expenses arise out of causes of action for tort, including negligence, contract, warranty, or strict liability.

5. The Recipient agrees to the following use restrictions of the electronic files:

a. The use of these files is limited only to the operation and maintenance of the above referenced project(s).

6. By signing below, the Recipient accepts full responsibility for the use of all electronic files received from and/or produced by Tetra Tech for the Project(s) listed above and any documents, instructions, or otherwise produced there from by the Recipient along with all Terms of Electronic Transfer indicated herein. A copy of this Agreement, executed by Tetra Tech, will be provided before or with the first electronic file transmittal.

Signature	Type or Print Name	Title	Date

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

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 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Reports.

1.3 INFORMATIONAL SUBMITTALS

A. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period. Follow format outlined in attachment at end of this Section.
B. Site Condition Reports: Submit at time of discovery of differing conditions.
C. Special Reports: Submit at time of unusual event.

1.4 COORDINATION

A. Secure time commitments for performing critical elements of the Work from entities involved.
B. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.5 CONTRACTOR’S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.
B. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

1.6 CONTRACTOR’S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, horizontal, Gantt-chart-type, Contractor's construction schedule per requirements of Division 01 Section “Project Summary – Project Schedule.”

1. Format: Refer to accompanying “Format for Construction Schedule.”

B. Preparation: Indicate each significant construction activity separately, by Specification Section, coordinated with the schedule of values. Provide line item(s) for each Specification Section.

C. Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities.

D. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, testing and inspecting agencies, and other parties with a need-to-know schedule responsibility.

1. When revisions are made, distribute updated schedules to the same parties.

1.7 REPORTS

A. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

B. Special Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

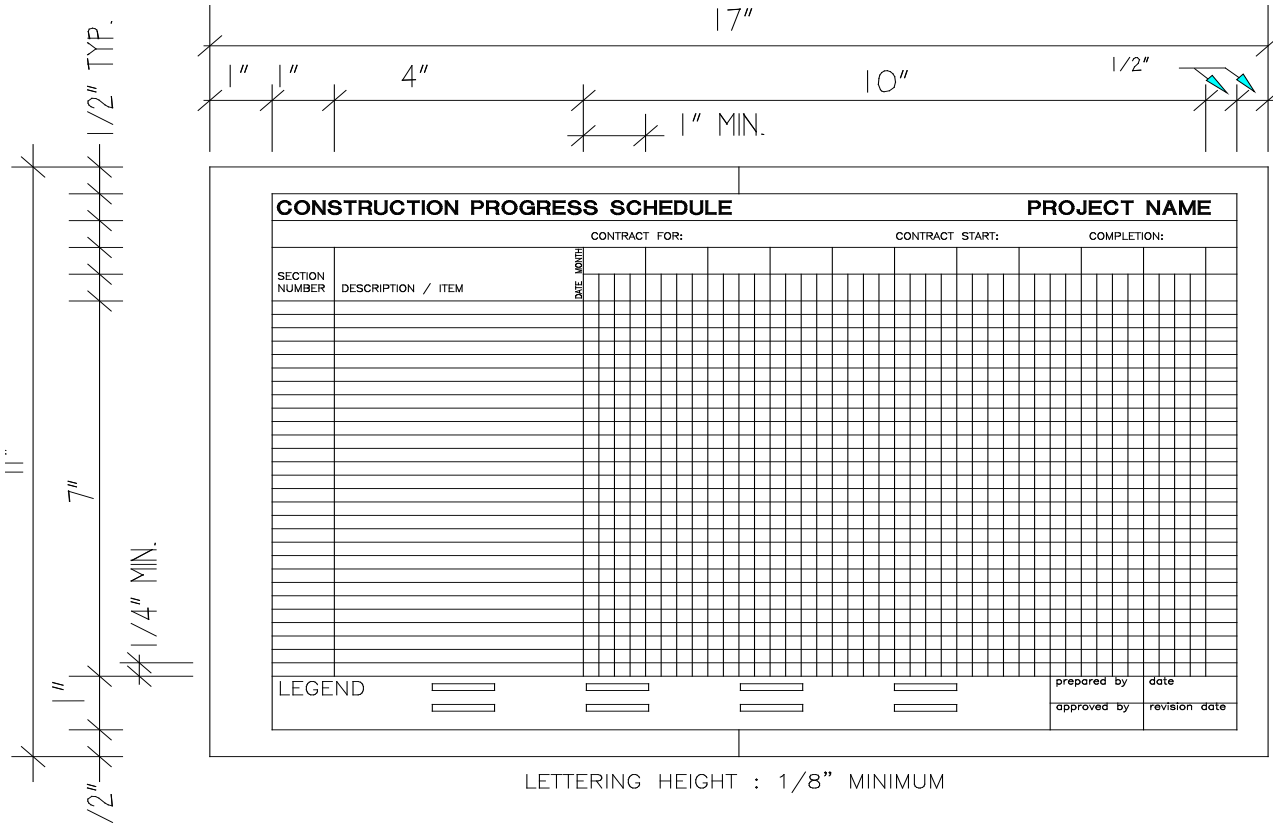
Attachment: Format for Construction Schedule

END OF SECTION 01 32 00

SECTION 01 32 00 - PROJECT SCHEDULE - Attachment #1

FORMAT FOR
CONSTRUCTION SCHEDULE

(Refer to SECTION 01 32 00, Article 2.2)



Format

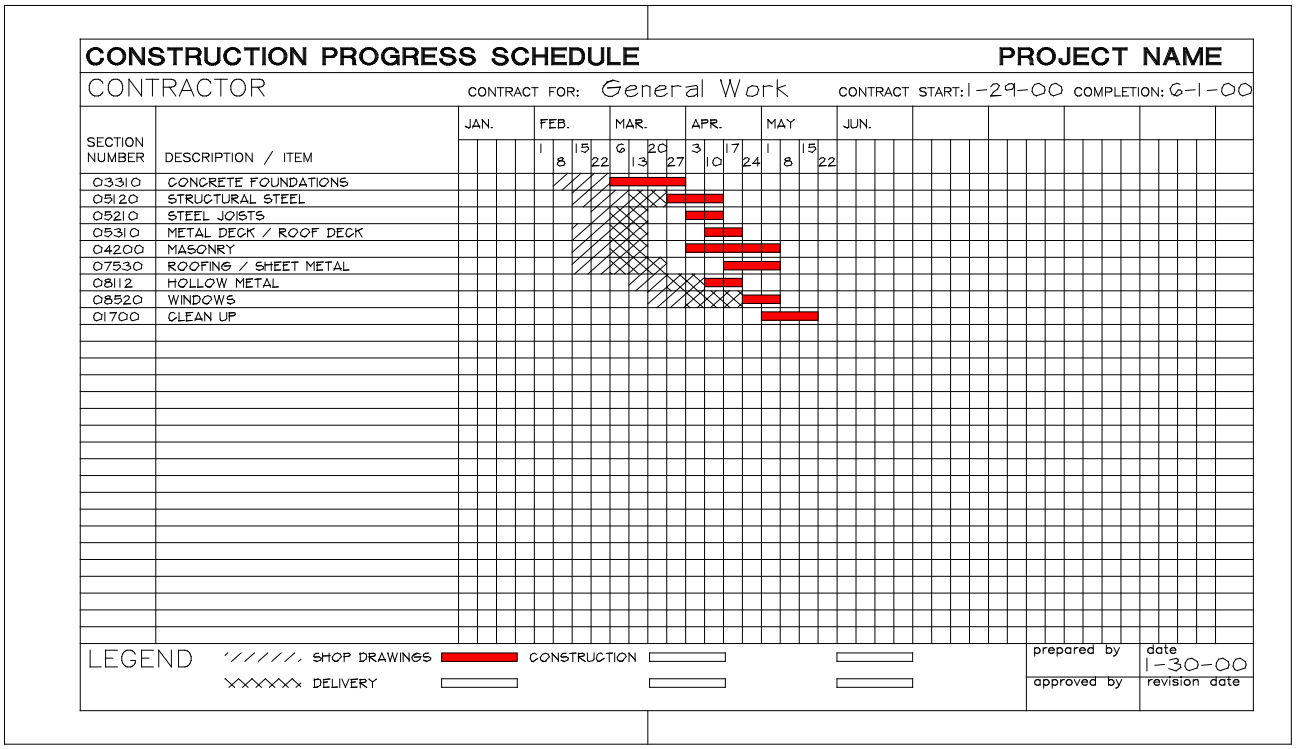
Provide separate bar for each item in sequential order from beginning of Project to completion with the following information included for each item:

Related Technical Specification number.
Distinct graphic delineation, indicating area of building where schedule item in located.
Shop drawing submittal date and required acceptance date.
Product procurement date and anticipated delivery date.
Projected start and completion dates for each item.

SECTION 01 32 00 - PROJECT SCHEDULE - Attachment #1

FORMAT FOR
CONSTRUCTION SCHEDULE

(Refer to SECTION 01 32 00, Article 2.2)



Sample

Provide separate bar for each item in sequential order from beginning of Project to completion with the following information included for each item:

Related Technical Specification number.
Distinct graphic delineation, indicating area of building where schedule item in located.
Shop drawing submittal date and required acceptance date.
Product procurement date and anticipated delivery date.
Projected start and completion dates for each item.

SECTION 01 33 00 - SUBMITTAL PROCEDURES

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 SUMMARY

A. Section includes requirements for the administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1. Process designated submittals for the Project electronically through designated Electronic Submittal System. PDF files must be opened, viewed, modified and printed using Adobe Acrobat PDF software to view reviewer comments/stamps.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager’s responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. As-Specified Products: Products to be incorporated into Project as specified by manufacturer name and product designation and including all options in Part 2 of technical specifications, intended to be installed as specified in Part 3 of technical specifications, and from a product category specifically identified as eligible to be considered as an “as-specified product” in the Action Submittals Article in Part 1 of technical specifications.

C. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager’s responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

E. Electronic Submittal System: A method to transmit certain electronic submittals between the Contractor, Construction Manager, Architect, and Owner, using Submittal Exchange website service.

1. For consistency, the standard file format will be PDF. Convert paper originals and other file formats to PDF prior to submission.

2. In the event of system malfunction, process submittals in accordance with the Architect’s instructions, until the system malfunction has been corrected.

3. For this Project, process the following submittal types through the designated electronic submittal system:

    a. Product Data.
    b. Shop Drawings.
    c. Product Schedules.
    d. Qualification Data.
    e. Certificates (Welding, Installer, Manufacturer, Product, and Material, as applicable).
    f. Test Reports (Material, Product, Preconstruction, Compatibility, and Field, as applicable).
    g. Research Reports.
    h. Warranty (sample).
    i. Design Data, including calculations.
    j. Coordination Drawings.
    k. Delegated-Design Services Certifications.

4. For Samples, provide electronic submittal of Sample cover sheet, identifying location and actual delivery date of Samples. Deliver Samples to location (Architect's office, Project site, etc.) as directed by the Architect.

1.4 COLOR SCHEDULE

A. Color Schedule: Within 30 days after date of Notice of Award, submit a complete list of proposed manufacturers and complete product designations (i.e. model, grade, series, product line, etc.) for each item requiring color selection by Architect.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Where indicated, submit all submittal items required for each Specification Section concurrently.

3. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow sufficient time for submittal review, including time for resubmittals. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Include a cover sheet on each submittal item for identification. Do not combine different submittals under same cover sheet; only one submittal is to be provided per email.

   a. Cover Sheet Form: Use PDF version of sample form included in Project Manual. Complete each item on form, sign and date. Architect will furnish PDF version of sample form.

2. Name submittal file as directed by Architect.

3. Transmit each submittal via Electronic Submittal System.

4. Transmit each submittal to Architect using the Submittal Exchange website www.submittalexchange.com.

D. Resubmittals: Make resubmittals in same form and, for non-electronic submittals, in the same number of copies as initial submittal.

1. Note date and content of revision in label or title block and clearly indicate extent of revision.

2. Resubmit submittals until they are marked with approval notation from Architect and Construction Manager.

3. Refer to the General Conditions for provisions allowing Owner to obtain reimbursement from the Contractor for amounts paid to the Architect for evaluation of certain resubmittals.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.

F. Use for Construction: Retain complete electronic copies of submittals on Project site during Construction. Also maintain one complete set of hard paper copies of all approved submittals on Project site during Construction. Use only final action submittals that are marked with approval notation from Architect and Construction Manager.

G. Use of As-Specified Verification Form: The As-Specified Verification Form is intended to reduce certain action submittal paperwork for select products to be incorporated into the Work. If product to be incorporated into Project is specified by name and product designation in Part 2 of the Technical Specification Section and is from a product category specifically identified as eligible to be considered as an “as-specified product” in the Action Submittals Article in Part 1 of technical specifications, submit **“As-Specified Verification Form”** attached to this Specification Section.

1.6 ENVIRONMENTAL REQUIREMENTS

A. All products provided for use in construction of this Project are to be free of asbestos. Refer to Division 01 Section "Closeout Procedures" for certification required to be provided. The Owner may provide random testing of installed products/ construction for asbestos content. Any Contractor-installed product found to contain asbestos shall be classified as defective work. Defective work shall be corrected by the Contractor as specified in the General Conditions.

1.7 SUBMITTAL PROCEDURES, GENERAL

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1.8 ELECTRONIC SUBMITTAL REQUIREMENTS

A. Use the designated electronic submittal system for submittals in this Article.

1. Review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.

2. Transmit each submittal to Construction Manager and Architect using the Submittal Exchange website, www.submittalexchange.com.

3. For Action Submittals, Architect / Engineer and Construction Manager review comments will be made available on the Submittal Exchange website for downloading. Contractor will receive email notice of completed review.

4. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.

5. After award of contract, training will be provided by Submittal Exchange regarding use of website and PDF submittals. Contact Submittal Exchange at 1-800-714-0024.

6. Internet Service and Equipment Requirements:

    a. Email address and Internet access at Contractor's main office.
    b. Adobe Acrobat (www.adobe.com), for applying electronic stamps and comments.

7. If the Contractor is responsible for delays in the final completion and closeout beyond the contract specified time, the Owner is entitled to reimbursement from the Contractor for amounts paid by the Owner to subsequently extend the Electronic Submittal System (Submittal Exchange).

8. Retain one electronic copy of all approved submittals, as part of the project records required at Project Closeout.

9. Tetra Tech Architects and Engineers will be the Submittal Exchange Project Leader and Subscriber.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. Mark submittal to show which products and options are applicable.

2. Include the following information, as applicable:

   a. Manufacturer's catalog cuts.
   b. Statement of compliance with specified referenced standards.
   c. Testing by recognized testing agency.

3. For equipment, include the following in addition to the above, as applicable:

   a. Printed performance curves.
   b. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

C. As-Specified Submittals: Complete the **"As-Specified Verification Form."**

1. Refer to the Action Submittals Article of technical specification sections. If the product to be incorporated into the Project is an "as-specified product" as defined in this Section, then submit **"As-Specified Verification Form"** in lieu of Product Data, otherwise submit full Product Data.

2. Do not use **"As-Specified Verification Form"** unless specifically indicated in technical specification.

3. The **"As-Specified Verification Form"** alone serves as the submittal for the specific product and no additional action submittal data is due at the time of the submittal. The full specific product technical data, however, is required to be included in the Operation and Maintenance Manual. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data".

D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of dimensions established by field measurement.
   e. Relationship and attachment to adjoining construction clearly indicated.
   f. Seal and signature of professional engineer if specified.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.

F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

G. Certificates:

1. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS or ASME forms as applicable. Include names of firms and personnel certified.

2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

4. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

5. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

H. Test Reports:

1. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

2. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

3. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

4. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

5. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

I. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

J. Warranty: Submit sample warranties as required in individual Specification Sections.

K. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

L. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

M. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit certificate, signed and sealed by the responsible professional engineer, for each product and system specifically assigned to Contractor to be designed or certified by a professional engineer, indicating compliance with building code in effect for Project.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 SUBMITTAL REQUIREMENTS FOR COMMISSIONING

A. Provide the Commissioning Authority with a copy of all submittals for equipment to be commissioned.

1. The Commissioning Authority will review and approve Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the Architect’s review.

B. Data for Commissioning:

1. Refer to the technical Division Commissioning Section for listing of systems to be commissioned. Provide specific information needed about each piece of commissioned equipment or system in submittal as required to facilitate commissioning. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians for pre-functional testing shall be submitted to the Commissioning Authority.

2. The Commissioning Authority may request further documentation necessary for the commissioning process. This data request may be made prior to submittals, during review, or subsequently as additional requirements become evident.

3. Much of this information is contained in the regular Operation and Maintenance (O&M) manual submittals normally submitted in the Project. For commissioned projects, this information is typically required prior to the regular formal O&M manual submittals and will be duplicated therein, facilitating the later creation of the O&M manual.

C. Contractor’s responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by the Commissioning Authority’s review.

1.10 NON-ELECTRONIC SUBMITTAL REQUIREMENTS

A. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:

   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Deliver one set to Architect's office, deliver the other set to the construction trailer at the job site.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit two sets of Samples. Deliver one set to Architect's office, deliver the other set to the construction trailer at the job site.

1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

B. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.

3. Submit subcontract list in the following format:

a. Number of Copies: Four paper copies of subcontractor list, unless otherwise indicated. Architect will return one copy.

C. List of Key Personnel Names: No later than 15 days after date of Notice of Award, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site.

1. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including emergency, office, and cellular telephone numbers and email addresses.

a. Number of Copies: Four paper copies of key personnel list, unless otherwise indicated.

1.11 MISCELLANEOUS SUBMITTAL REQUIREMENTS

A. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

B. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

1.12 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.13 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Identify any deviations from Contract Document requirements. Mark cover sheet with approval before submitting to Architect and Construction Manager.

1. Sign and date statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

2. If using Adobe Acrobat to electronically sign the Submittal Cover Sheet do not use the Certify Sign, Time Stamp feature as this will lock the document for further editing.

1.14 ARCHITECT'S AND CONSTRUCTION MANAGER'S ACTION

A. General: Architect and Construction Manager will not review submittals that do not bear Contractor's approval and will return them without action.

B. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect and Construction Manager will mark submittal appropriately to indicate action, as follows:

1. Final Unrestricted Release: Where the submittal is marked "Approved," the Work covered by the submittal may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.

2. Final-but-Restricted Release: Where the submittal is marked "Approved As Noted," the Work covered by the submittal may proceed provided it complies both with Architect's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.

3. Rejected: Where the submittal is marked "Rejected," do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.

4. Incomplete - Resubmit: Where the submittal is marked "Incomplete, Submit Additional Information," do not proceed with the Work covered by the submittal. Prepare additional information requested, or required by the Contract Documents, that indicates compliance with requirements, and resubmit.

C. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Limit information submitted to specific products indicated. Do not submit extraneous matter. Submittals containing excessive extraneous matter will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents may be returned by the Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

Attachments: Tt Cover Sheet
As-Specified Verification Form
Tt Cover Sheet for Closeout Submittals (Sections 01 78 23 and 01 78 39)
QUEST Cover Sheet to be used ONLY for Submittals for Sections 02 82 00.
Delegated Design Submittal Form

END OF SECTION 01 33 00

CONTRACTOR: _____ **SUBMITTAL DATE** ____/____/____

_____

Check following as applicable:

ARCHITECT: Tetra Tech Architects & Engineers

☐ First Submission

☐ Re-Submission No. ____

PROJECT IDENTIFICATION

Architect's
Project No.: 279180-24002.1

Proj. Name: Reconstruction to Beacon HS Boiler/Chiller

Location: _____

PRODUCT IDENTIFICATION

Specification Section No. _____

Name of Product: _____

_____

Name of Manufacturer: _____

SUBCONTRACTOR

_____

SUPPLIER

_____

RELATIONSHIP TO STRUCTURE

Building
Name _____

_____
(Room #) *(Room Name)*

Contract Drawing No.: _____

RESERVED FOR USE BY TETRA TECH

ACTION SUBMITTAL:

☐ Approved

☐ Approved As Noted

☐ Rejected

☐ Incomplete, Submit Additional Information

INFORMATIONAL SUBMITTAL:

☐ No Action Taken

☐ Returned for Resubmittal

Reviewed By: _____

Date: _____

Reviewed only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review 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. Review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences or procedures.

DEVIATION FROM CONTRACT DOCUMENTS: _____

_____

CONTRACTOR COMMENTS: _____

_____

ARCHITECT'S COMMENTS: _____

_____

CONTRACTOR'S STAMP

CONTRACTOR'S CERTIFICATION
I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED AND APPROVED BY THE CONTRACTOR IN ACCORDANCE WITH THE GENERAL CONDITIONS. PRODUCTS/MATERIALS ARE FREE OF ASBESTOS AS REQUIRED BY THE CONTRACT DOCUMENTS.

BY _____

CONSTRUCTION MANAGER'S CERTIFICATION
I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED AND APPROVED BY THE CONSTRUCTION MANAGER IN ACCORDANCE WITH THE GENERAL CONDITIONS.

BY _____

CM Submittal No. _____

TETRA TECH
ARCHITECTS & ENGINEERS

As-Specified Verification Form

Project Number: 279180-24002.1

Project Title: Reconstruction to Beacon HS Boiler/Chiller

Technical Specification Section: _____
(Include Section Number and Title as shown in Project Manual)

Specified Product: _____
(Include manufacturer's name and product designation)

The undersigned, hereinafter called the Contractor, hereby warrants that the Specified Product listed above will be incorporated into the Project in accordance with requirements specified in the Technical Specification Section identified above without modification or alteration.

By acceptance of this form, Tetra Tech Architects & Engineers (hereinafter called Tetra Tech), agrees that limited submittals identified in the Technical Specification Section identified above are not required, unless otherwise stated in the Submittals article in the Technical Specification Section.

The Contractor is advised that use of this As-Specified Verification Form does not relieve the Contractor from providing remaining submittal documentation required in Technical Specification sections and all information required in Division 1 Closeout section of the Project Manual or from complying with requirements of the General Conditions.

Products/Materials are free of asbestos as required by the Contract Documents.

_____
(Name of Contractor)

_____
(Authorized Signature)

_____
(Title of Signatory)

_____
(Date)

RESERVED FOR USE BY TETRA TECH

ACTION SUBMITTAL:

☐ Approved / Approved As Noted

☐ Rejected

Reviewed By: _____

Date: _____

Reviewed only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review 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. Review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences or procedures.

ARCHITECT'S COMMENTS: _____

CONTRACTOR: _____ **SUBMITTAL DATE** ____/____/____

_____

Check following as applicable:

☐ First Submission ____

ARCHITECT: Tetra Tech Architects & Engineers

☐ Re-Submission No. ____

PROJECT IDENTIFICATION

Architect's
Project No.: 279180-24002.1

Proj. Name: Reconstruction to Beacon HS Boiler/Chiller

Location: _____

PRODUCT IDENTIFICATION

Specification Section No. **01 78 23 OR 01 78 39** *(circle correct one)*

Name of Product: _____

_____

Name of Manufacturer: _____

SUBCONTRACTOR: _____

SUPPLIER: _____

RESERVED FOR USE BY TETRA TECH

INFORMATIONAL SUBMITTAL:

☐ No Action Taken

☐ Returned for Resubmittal

Reviewed By: _____

Date: _____

Reviewed only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review 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. Review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences or procedures.

DEVIATION FROM CONTRACT DOCUMENTS: _____

_____

CONTRACTOR COMMENTS: _____

_____

CONSTRUCTION MANAGER'S COMMENTS: _____

_____

ARCHITECT'S COMMENTS: _____

_____

CONTRACTOR'S STAMP

CONTRACTOR'S CERTIFICATION

I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED AND APPROVED BY THE CONTRACTOR IN ACCORDANCE WITH THE GENERAL CONDITIONS. PRODUCTS/MATERIALS ARE FREE OF ASBESTOS AS REQUIRED BY THE CONTRACT DOCUMENTS.

BY _____

CONSTRUCTION MANAGER'S CERTIFICATION

I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED BY THE CONSTRUCTION MANAGER IN ACCORDANCE WITH THE GENERAL CONDITIONS. AND IN ACCORDANCE WITH THE CONSTRUCTION MANAGER'S CONTRACTUAL OBLIGATIONS WITH THE OWNER.

Approved _____ Rejected_____

BY _____

CM Submittal No. _____

CONTRACTOR: _____ **SUBMITTAL DATE** ____/____/____

_____

Check following as applicable:

CONSULTANT: _____

☐ First Submission ____

☐ Re-Submission No. ____

PROJECT IDENTIFICATION

Architect's
Project No.: 279180-22004 D

Proj. Name: Reconstruction to Beacon HS Boiler/Chiller

Location:_____

PRODUCT IDENTIFICATION

Specification Section No._____

Name of Product:_____

_____

Name of Manufacturer:_____

SUBCONTRACTOR: _____

_____

SUPPLIER: _____

RELATIONSHIP TO STRUCTURE: _____

_____

Building Name:_____

_____

(Room #) *(Room Name)*

Contract Drawing No.:_____

QUEST - OWNER'S DIRECT CONSULTANT

ACTION SUBMITTAL:

☐ Approved

☐ Approved As Noted

☐ Rejected

☐ Incomplete, Submit Additional Information

INFORMATIONAL SUBMITTAL:

☐ No Action Taken

☐ Returned for Resubmittal

Reviewed By: _____

Date: _____

DEVIATION FROM CONTRACT DOCUMENTS: _____

_____

CONTRACTOR COMMENTS: _____

_____

OWNER'S CONSULANT COMMENTS: _____

_____

CONTRACTOR'S STAMP

CONTRACTOR'S CERTIFICATION

I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED AND APPROVED BY THE CONTRACTOR IN ACCORDANCE WITH THE GENERAL CONDITIONS. PRODUCTS/MATERIALS ARE FREE OF ASBESTOS AS REQUIRED BY THE CONTRACT DOCUMENTS.

BY _____

CONSTRUCTION MANAGER'S CERTIFICATION

I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED AND APPROVED BY THE CONSTRUCTION MANAGER IN ACCORDANCE WITH THE GENERAL CONDITIONS.

BY _____

CM Submittal No. _____

DELEGATED DESIGN SUBMITTAL

CONTRACTOR: _____ **SUBMITTAL DATE** ____ /____ /____

DESIGN PROFESSIONAL: _____ Check following as applicable:

ARCHITECT: Tetra Tech Architects & Engineers

☐ First Submission

☐ Re-Submission No. ___

PROJECT IDENTIFICATION

Architect's
Project No.: 279180-24002.1

Proj. Name: Reconstruction to Beacon HS Boiler/Chiller

Location: _____

PRODUCT IDENTIFICATION

Specification Section No. _____

Name of Product: _____

_____

Name of Manufacturer: _____

SUBCONTRACTOR

_____

SUPPLIER

_____

RELATIONSHIP TO STRUCTURE

Building
Name _____

_____
(Room #) *(Room Name)*

Contract Drawing No.: _____

DEVIATION FROM CONTRACT DOCUMENTS:

_____

_____

_____

RESERVED FOR USE BY TETRA TECH

ACTION SUBMITTAL:

☐ Approved

☐ Approved As Noted

☐ Rejected

☐ Incomplete, Submit Additional Information

INFORMATIONAL SUBMITTAL:

☐ No Action Taken

☐ Returned for Resubmittal

Reviewed By: _____

Date: _____

Reviewed only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review 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. Review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences or procedures.

DESIGN PROFESSIONAL'S COMMENTS: _____

CONTRACTOR COMMENTS: _____

ARCHITECT'S COMMENTS: _____

CONSTRUCTION MANAGER'S CERTIFICATION
I certify that this submittal has been reviewed and approved by the Construction Manager in accordance with the General Conditions.

BY _____

CM Submittal No. _____

CONTRACTOR'S STAMP

DESIGN PROFESSIONAL'S CERTIFICATION
I certify that I am a design professional currently licensed in New York State and confirm my responsibility for work included in this submittal in accordance with the General Conditions. Further, I certify that to the best of my 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 and construction standards of the Education Department.

BY _____

CONTRACTOR'S CERTIFICATION
I certify that this submittal has been reviewed and approved by the Contractor in accordance with the General Conditions. Products/Materials
Are free of asbestos as required by the Contract Documents.

BY _____

SECTION 01 35 26 – GOVERNMENTAL SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Safety requirements included in 8 NYCRR 155.5 Uniform Safety Standards for School Construction and Maintenance Projects.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Provide all measures, including (but not limited to) materials, equipment, and procedures, required to comply with following requirements of 8 NYCRR 155.5 Uniform Safety Standards for School Construction and Maintenance Projects.

B. Certificate of Occupancy:

1. 8 NYCRR 155.5 (a): “The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy.”

C. General Safety and Security Standards for Construction Projects:

1. 8 NYCRR 155.5 (e)(1): “All construction materials shall be stored in a safe and secure manner.”

2. 8 NYCRR 155.5 (e)(2): “Fences around construction supplies or debris shall be maintained.”

3. 8 NYCRR 155.5 (e)(3): “Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.”

4. 8 NYCRR 155.5 (e)(4): “During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.”

5. 8 NYCRR 155.5 (e)(5): “Workers shall be required to wear photo identification badges at all times for identification and security purposes while working at occupied sites.”

D. Separation of Construction Areas from Occupied Spaces:

1. 8 NYCRR 155.5 (f): "Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas."

2. 8 NYCRR 155.5 (f)(1): "A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students or school staff."

E. Cleaning Occupied Areas:

1. 8 NYCRR 155.5 (f)(2): "Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building."

2. 8 NYCRR 155.5 (f)(3): "All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session."

F. Exiting and Ventilation:

1. 8 NYCRR 155.5(g): Maintain exiting and ventilation during school construction projects.
2. 8 NYCRR 155.5(g)(1): "Required exits, temporary stairs, ramps, exit signs, and door hardware shall be provided at all times."
3. 8 NYCRR 155.5(g)(2): "Required ventilation to occupied spaces affected by construction will be maintained during the project."

G. Noise Control:

1. 8 NYCRR 155.5 (i): "Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken."

H. Control of Fumes, Gases and Contaminants:

1. 8 NYCRR 155.5 (j): The contractor shall be responsible for the control of chemical fumes, gases, and other contaminants produced by welding, gasoline or diesel engines, roofing, paving, painting, and other fumes to ensure they do not enter occupied portions of the building or air intakes.

I. “Off-Gassing” of Volatile Organic Compounds:

1. 8 NYCRR 155.5 (j)(1): The contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paint, furniture, carpeting, wall coverings, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturer’s recommendations before a space can be occupied.

J. Asbestos Isolation:

1. 8 NYCRR 155.5 (k): “Large and small asbestos abatement projects as defined by 12 NYCRR 56 shall not be performed while the building is occupied.” Note, it is NYSED’s interpretation that the term "building", as referenced in this section of 8 NYCRR 155.5, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion and ventilation systems must be physically separated and sealed at the isolation barrier.

2. Exterior work such as roofing, flashing, siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and at windows is provided. Care must be taken to schedule work so that classes are not disrupted by noise or visual distraction.

K. Lead and Asbestos Testing:

1. 8 NYCRR 155.5 (c)(1): “All school areas to be disturbed during renovation or demolition shall be tested for lead and asbestos.”

a. Asbestos and Asbestos-Containing Materials:

1) Be advised that disturbance of asbestos and asbestos-containing materials is not anticipated as part of this Project.

a) Prior to beginning Work, review Owner’s “Asbestos Management Plan” to ensure asbestos or asbestos-containing materials identified in that document are not disturbed.

2) Be advised that if materials suspected to be asbestos, or to contain asbestos, that are not included in the Project and not identified in the Contract Documents are encountered during construction, immediately notify Owner and take precautions as required to avoid disturbing materials until directed by Owner.

b. Lead and Lead-Containing Materials:

1) Be advised that a lead inspection has been performed as required by New York State Education Department and a copy of the lead inspection report is available at the Owner's offices.

L. Code Rule 56:

1. 8 NYCRR 155.5(k): "All asbestos abatement projects shall comply with all applicable Federal and State laws including but not limited to the New York State Department of Labor industrial code rule 56 (12 NYCRR 56), and the Federal Asbestos Hazard Emergency Response Act (AHERA), 40 CFR part 763 (Code of Federal Regulations, 1998 Edition, Superintendent of Public Documents, U.S. Government Printing Office, Washington, DC 20402; 1998; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234."

M. Lead:

1. 8 NYCRR 155.5 (l): Surfaces that will be disturbed by reconstruction must have a determination made as to the presence of lead. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details provisions for occupant protection, worksite preparation, work methods, cleaning and clearance testing which are in general accordance with the HUD Guidelines.

    a. Be advised that disturbance of lead and lead-containing materials is not anticipated as part of this Project.

    b. Contractor is responsible for complying with requirements of all applicable federal, state and local regulations, including (but not limited to) OSHA Lead in Construction Standard 29 CFR 1926.62, when construction activities involve disturbance of materials containing 1.0 mg/sq cm or 0.5 percent of lead or less, including (but not limited to) lead-based paint, ceramic tile, and similar materials.

    c. If materials suspected to contain lead above 1.0 mg/sq cm or above 0.5 percent that are not included in Project or identified in Contract Documents are encountered during construction, immediately notify Owner and take applicable precautions to avoid disturbing materials until directed by Owner.

N. Disposal of Lead Abatement Waste:

1. Test all debris from lead abatement activities to determine whether it is hazardous or non-hazardous waste.

2. Transport and dispose of debris determined to be hazardous waste in accordance with applicable regulations.

3. Package, label, and mark all hazardous waste materials in accordance with applicable requirements of 49 CFR 173, 178 and 179.

4. Maintain hazardous waste manifest from date of transport until date of disposal, destruction or recycling.

5. Return fully executed hazardous waste manifests to Owner within 60 days after date waste accepted by initial transporter.

6. Dispose of material determined to be Construction and Demolition Debris in accordance with 6 NYCRR 360 and 364. Provide trip tickets or other documentation clearly

identifying generating site, Owner, transporter, disposal site and amount of material removed from site, transported to and disposed of at disposal site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 35 26

SECTION 01 40 00 - QUALITY REQUIREMENTS

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 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Construction Manager**,** or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

D. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

E. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administrative activities performed by Architect or Construction Manager.

1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified 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 requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATION SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.

C. Reports: Prepare and submit certified written reports and documents as specified.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 REPORTS AND DOCUMENTS

A. Reports and documents are to be uploaded to Submittal Exchange under the Testing Reports – Contractors tab.

B. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

C. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

D. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, correct, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

a. For testing or inspecting services indicated as Owner’s responsibility, notify Owner and testing agency at least 3 business days in advance of time when Work that requires testing or inspecting will be performed.

5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Construction Manager and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Preliminary design mix proposed for use for material mixes that require control by testing agency.

6. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency conducting test.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and Construction Manager’s, reference during normal working hours.

3.2 CORRECTION AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Correction and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCES

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 DEFINITIONS

A. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

B. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

C. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

D. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

E. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project Site.

F. "Provide": Furnish and install, complete and ready for the intended use.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents 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. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1. When the building code in effect for the Project cites a different edition, comply with the building code-cited edition.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AA - Aluminum Association (The); www.aluminum.org.
2. AABC - Associated Air Balance Council; www.aabc.com.
3. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
4. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
5. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
6. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
7. ABBA - Air Barrier Association of America; www.airbarrier.org.
8. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
9. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
10. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
11. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
12. AF&PA - American Forest & Paper Association; www.afandpa.org.
13. AGA - American Gas Association; www.aga.org.
14. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
15. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
16. AI - Asphalt Institute; www.asphaltinstitute.org.
17. AIA - American Institute of Architects (The); www.aia.org.
18. AISC - American Institute of Steel Construction; www.aisc.org.
19. AISI - American Iron and Steel Institute; www.steel.org.
20. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
21. ALSC - American Lumber Standard Committee, Incorporated; www.alsc.org.
22. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
23. ANSI - American National Standards Institute; www.ansi.org.
24. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
25. APA - APA - The Engineered Wood Association; www.apawood.org.
26. APA - Architectural Precast Association; www.archprecast.org.
27. API - American Petroleum Institute; www.api.org.
28. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
29. ARI - American Refrigeration Institute; (See AHRI).
30. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
31. ASCE - American Society of Civil Engineers; www.asce.org.
32. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
33. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
34. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
35. ASNT - American Society for Nondestructive Testing (The); www.asnt.org
36. ASSE - American Society of Safety Engineers (The); www.asse.org.

37. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
38. ASTM - ASTM International; www.astm.org.
39. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
40. AWCI - Association of the Wall and Ceiling Industry; www.awci.org.
41. AWEA - American Wind Energy Association; www.awea.org.
42. AWI - Architectural Woodwork Institute; www.awinet.org.
43. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
44. AWPA - American Wood Protection Association; www.awpa.com.
45. AWS - American Welding Society; www.aws.org.
46. AWWA - American Water Works Association; www.awwa.org.
47. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
48. BIA - Brick Industry Association (The); www.gobrick.com.
49. BICSI - BICSI, Inc.; www.bicsi.org.
50. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
51. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
52. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
53. CDA - Copper Development Association; www.copper.org.
54. CE – Conformite Europeenne; http://ec.europa.eu/growth/single-market/ce-marking/.
55. CEA - Canadian Electricity Association; www.electricity.ca.
56. CEA - Consumer Electronics Association; www.ce.org.
57. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
58. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
59. CGA - Compressed Gas Association; www.cganet.com.
60. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
61. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
62. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
63. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
64. CPA - Composite Panel Association; www.pbmdf.com.
65. CPPA – (Formerly: Corrugated Polyethylene Pipe Association; a Division of the Plastic Pipe Institute); www.plasticpipe.org/drainage/.
66. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
67. CRRC - Cool Roof Rating Council; www.coolroofs.org.
68. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
69. CSA - Canadian Standards Association; www.csa.ca.
70. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
71. CSI - Construction Specifications Institute (The); www.csinet.org.
72. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
73. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
74. CWC - Composite Wood Council; (See CPA).
75. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
76. DHI - Door and Hardware Institute; www.dhi.org.
77. ECA - Electronic Components Association;(See ECIA).
78. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
79. ECIA – Electronic Components Industry Association; www.eciaonline.org.
80. EIA - Electronic Industries Alliance; (See TIA).
81. EIMA - EIFS Industry Members Association; www.eima.com.
82. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.

83. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
84. ESTA - Entertainment Services and Technology Association; (See PLASA).
85. ETL - Intertek (See Intertek); www.intertek.com.
86. EVO - Efficiency Valuation Organization; www.evo-world.org.
87. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
88. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
89. FM Approvals - FM Approvals LLC; www.fmglobal.com.
90. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
91. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
92. FSA - Fluid Sealing Association; www.fluidsealing.com.
93. FSC - Forest Stewardship Council U.S.; www.fscus.org.
94. FSEC - Florida Solar Energy Center; www.fsec.ucf.edu.
95. GA - Gypsum Association; www.gypsum.org.
96. GANA - Glass Association of North America; www.glasswebsite.com.
97. GS - Green Seal; www.greenseal.org.
98. HI - Hydraulic Institute; www.pumps.org.
99. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
100. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
101. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
102. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
103. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
104. IAS – International Accreditation Service; www.iasonline.org.
105. IAS - International Approval Services; (See CSA).
106. ICBO - International Conference of Building Officials; (See ICC).
107. ICC - International Code Council; www.iccsafe.org.
108. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
109. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
110. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
111. IEC - International Electrotechnical Commission; www.iec.ch.
112. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
113. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
114. IESNA - Illuminating Engineering Society of North America; (See IES).
115. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
116. IGCC - Insulating Glass Certification Council; www.igcc.org.
117. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
118. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
119. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
120. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
121. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
122. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
123. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
124. ISO - International Organization for Standardization; www.iso.org.
125. ISSFA - International Solid Surface Fabricators Association; (See ISFA).

126. ITU - International Telecommunication Union; www.itu.int/home.
127. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
128. LMA - Laminating Materials Association; (See CPA).
129. LPI - Lightning Protection Institute; www.lightning.org.
130. MBMA - Metal Building Manufacturers Association; www.mbma.com.
131. MCA - Metal Construction Association; www.metalconstruction.org.
132. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
133. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
134. MHIA - Material Handling Industry of America; www.mhia.org.
135. MIA - Marble Institute of America; www.marble-institute.com.
136. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
137. MPI - Master Painters Institute; www.paintinfo.com.
138. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
139. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
140. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
141. NADCA - National Air Duct Cleaners Association; www.nadca.com.
142. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
143. NALP – National Association of Landscape Professionals (Formerly Professional Landcare Network); www.landscapeprofessionals.org.
144. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
145. NBI – New Buildings Institute; www.newbuildings.org.
146. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
147. NCMA - National Concrete Masonry Association; www.ncma.org.
148. NEBB - National Environmental Balancing Bureau; www.nebb.org.
149. NECA - National Electrical Contractors Association; www.necanet.org.
150. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
151. NEMA - National Electrical Manufacturers Association; www.nema.org.
152. NETA - InterNational Electrical Testing Association; www.netaworld.org.
153. NFHS - National Federation of State High School Associations; www.nfhs.org.
154. NFPA - National Fire Protection Association; www.nfpa.org.
155. NFPA - NFPA International; (See NFPA).
156. NFRC - National Fenestration Rating Council; www.nfrc.org.
157. NHLA - National Hardwood Lumber Association; www.nhla.com.
158. NICET - National Institute for Certification in Engineering Technologies; www.nicet.org.
159. NLGA - National Lumber Grades Authority; www.nlga.org.
160. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
161. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
162. NRCA - National Roofing Contractors Association; www.nrca.net.
163. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
164. NSF - NSF International; www.nsf.org.
165. NSPE - National Society of Professional Engineers; www.nspe.org.
166. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
167. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
168. NWFA - National Wood Flooring Association; www.nwfa.org.
169. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
170. PDI - Plumbing & Drainage Institute; www.pdionline.org.
171. PLANET - Professional Landcare Network; (See NALP).

172. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
173. PTI - Post-Tensioning Institute; www.post-tensioning.org.
174. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
175. RFCI - Resilient Floor Covering Institute; www.rfci.com.
176. RIS - Redwood Inspection Service; www.redwoodinspection.com.
177. SAE - SAE International; www.sae.org.
178. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
179. SDI - Steel Deck Institute; www.sdi.org.
180. SDI - Steel Door Institute; www.steeldoor.org.
181. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
182. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
183. SGCC - Safety Glazing Certification Council; www.sgcc.org.
184. SIA - Security Industry Association; www.siaonline.org.
185. SJI - Steel Joist Institute; www.steeljoist.org.
186. SMA - Screen Manufacturers Association; www.smainfo.org.
187. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
188. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
189. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
190. SPIB - Southern Pine Inspection Bureau; www.spib.org.
191. SPRI - Single Ply Roofing Industry; www.spri.org.
192. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
193. SSINA - Specialty Steel Industry of North America; www.ssina.com.
194. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
195. STI - Steel Tank Institute; www.steeltank.com.
196. SWI - Steel Window Institute; www.steelwindows.com.
197. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
198. TABB - Testing, Adjusting and Balancing Bureau; www.tabbcertified.org.
199. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
200. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
201. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
202. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
203. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
204. TMS - The Masonry Society; www.masonrysociety.org.
205. TPI - Truss Plate Institute; www.tpinst.org.
206. TPI - Turfgrass Producers International; www.turfgrasssod.org.
207. TRI - Tile Roofing Institute; www.tileroofing.org.
208. UFAC - Upholstered Furniture Action Council; www.ufac.org.
209. UL - Underwriters Laboratories Inc.; www.ul.com.
210. ULC - Underwriters Laboratories of Canada; www.ulc.ca.
211. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
212. USAV - USA Volleyball; www.usavolleyball.org.
213. USBA - United States Badminton Association; www.usabadminton.org.
214. USGBC - U.S. Green Building Council; www.usgbc.org.
215. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
216. WA – Wallcoverings Association; www.wallcoverings.org.

217. WASTEC - Waste Equipment Technology Association; www.wastec.org.
218. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
219. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
220. WDMA - Window & Door Manufacturers Association; www.wdma.com.
221. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
222. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
223. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
224. WWPA - Western Wood Products Association; www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FCC - Federal Communications Commission; www.fcc.gov.
9. FG - Federal Government Publications; www.gpo.gov.
10. GSA - General Services Administration; www.gsa.gov.
11. HUD - Department of Housing and Urban Development; www.hud.gov.
12. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
13. NIST - National Institute of Standards and Technology; www.nist.gov.
14. OSHA - Occupational Safety & Health Administration; www.osha.gov.
15. SD - Department of State; www.state.gov.
16. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
17. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
18. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
19. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
20. USP - U.S. Pharmacopeia; www.usp.org.
21. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. ADAAG - Accessibility Guidelines for Buildings and Facilities, Available from United States Access Board; www.access-board.gov.

2. AHERA - Asbestos Hazard Emergency Response Act, Available from US Environmental Protection Agency; www.epa.gov.

3. BCNYS - Building Code of New York State, Available from New York State Department of State; www.dos.ny.gov/DCEA/.

4. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.

5. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://quicksearch.dla.mil.

6. DSCC - Defense Supply Center Columbus; (See FS).

7. FED-STD - Federal Standard; (See FS).

8. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

9. IBC - International Building Code, Available from International Code Council; www.iccsafe.org.

10. LEED - Leadership in Energy and Environmental Design (Green Building Rating Systems), Available from U.S. Green Building Council; www.usgbc.org.

11. MILSPEC - Military Specification and Standards; (See DOD).

12. NEC - National Electrical Code, Available from NFPA (National Fire Protection Association); www.nfpa.org.

13. NSPC - National Standard Plumbing Code, Available from Plumbing-Heating-Cooling Contractors Association; www.phccweb.org.

14. NYSED/MPS - New York State Education Department Manual of Planning Standards, Available from New York State Education Department (Facilities Planning); www.p12.nysed.gov/facplan/forms.html.

15. USAB - United States Access Board; www.access-board.gov.

16. UFAS - Uniform Federal Accessibility Standards Available from Access Board; www.access-board.gov.

17. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. NYSDEC - New York State Department of Environmental Conservation; www.dec.ny.gov.
3. NYSDOH - New York State Department of Health; www.health.ny.gov.
4. NYSDOT - New York State Department of Transportation; www.dot.ny.gov.
5. NYSED - New York State Education Department (Facilities Planning); www.p12.nysed.gov/facplan/.
6. NYSERDA - New York State Energy Research and Development Authority; www.nyserda.ny.gov.
7. OSHPD - Office of Statewide Health Planning and Development (State of California); www.oshpd.ca.gov.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

1.4 SUBMITTALS, GENERAL

A. General: Submit all informational submittals required by this Section concurrently.

1.5 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.

B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.

C. Plastic Barrier Fencing: High-density polyethylene mesh, high-visibility orange; minimum 4 feet high with minimum 6-foot-long wood stakes spaced a maximum of 8 feet on center, and with a continuous wood top stake; steel wire or nylon cable ties every 12 inches on center; with warning signs as indicated or required.

2.2 TEMPORARY FACILITIES

A. Field Offices, General (Non Required): Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control. Use of permanent HVAC system is not permitted.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. HVAC Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

a. Directly vent all combustion gases to the exterior.

b. Design system to use 100 percent outside make-up air.

c. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Temp-Air, Inc.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and coordinated with Construction Manager which results in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service (by Mechanical Contractor): Install water service and distribution piping in sizes and pressures adequate for construction.

1. Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

2. Provide reduced pressure zone (RPZ) backflow preventer at connection to existing system. Provide appropriate drainage piping with air gap from the backflow preventer relief port to an approved discharge point.

a. Basis-of-Design Product: Watts Water Technologies; Series LF909.

3. Provide 3/4-inch hose connections at each level spaced so that a 200-foot-long hose will reach all areas of building where a Contractor requires water.

4. Provide sign at each outlet indicating temporary water sources are not for human consumption.

C. Sanitary Facilities (by Mechanical Contractor): Provide temporary toilets, wash facilities, and bottled drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Use of Owner's toilet facilities and drinking water facilities is not permitted.

1. Provide continual supply of toilet paper, paper towels, soap, and bottled drinking water.

D. Temporary Heating and Cooling (by Mechanical Contractor): Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

E. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.

b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

F. Electric Power Service (by Electrical Contractor): Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Connect temporary service to Owner's existing power source, as directed by Owner. Maintain equipment in a condition acceptable to Owner.

2. Service Requirements:

a. Provide 120/208 V, 60 Hz, single/three phase alternating current with capacity to accommodate maximum electric power and lighting requirements during construction.

b. Provide minimum of two each 120/208 V duplex outlets spaced so that a 50-foot-long extension cord will reach all areas of building where a Contractor requires electric power.

3. Distribution System: Provide poles, pole hardware, overhead, exterior and interior wiring, transformers, and similar items required for electric power service and lighting.

a. Single-Phase Wiring: 3-wire, 120/208 V feeders, with No. 12 three- or four-wire branch circuits conforming to NEC No. 210-7 and OSHA requirements, with branch circuit protective device.

1) Provide each branch circuit with 120/208 V, single-phase fused grounding-type power outlets, buss type SRX or SKY, with approved covered box and fuses as required.

2) Provide panelboards containing ground fault interrupter type circuit breakers meeting applicable NEC requirements with required number of poles.

a) Basis-of-Design Product: Square D by Schneider Electric; QO120GFI for each branch circuit allowing maximum total load of 16 amps on each 20 amp branch circuit.

3) Provide appropriately-sized green grounding wiring complying with NEC requirements in feeder and branch circuits to provide grounding of all 120 and 208 V outlets in approved manner.

b. Three-Phase Wiring: Three-wire, 208 V feeders, with fused disconnect switches, allowing minimum 5 hp motor load at 208 V from each feeder, and providing four three-phase outlets on each floor near points of use.

4. Extension Cords: Temporary 3-wire plug-in extensions with grounding features at both ends.

G. Lighting (by Electrical Contractor):: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Telephone Service (None Required): Provide temporary telephone service in Contractor's field office.

1. Provide Contractor's superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.

2. Maintain support facilities until Substantial Completion.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations in all areas of construction operations.

E. Waste Disposal Facilities (by Mechanical Contractor): Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section "Execution."

1. Waste from Construction Operations: Includes materials not intended or necessary for completion of Work, including packing materials, food waste, waste paper, and similar items. Excavated material is not included in this definition.

2. Chutes: Provide enclosed chutes for removal of waste from construction operations from levels above grade level or roof. Remove waste in a controlled manner; materials shall not be dropped or thrown from heights.

F. Recycling Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

G. Shoring and Bracing: Provide and maintain shoring, bracing, and structural supports, designed by a qualified professional engineer, required to preserve stability and prevent movement, settlement, or collapse of new and existing construction and to prevent unexpected or uncontrolled movement or collapse of construction.

H. Staging and Scaffolding (by each trade): Provide facilities necessary for supporting materials and personnel in accordance with requirements of authorities having jurisdiction.

I. Lifts and Hoists (by each trade): Provide facilities necessary for hoisting materials and personnel.

J. Temporary Elevator Use: Use of elevators is not permitted.

K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control:

1. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to “New York State Standards and Specifications for Erosion and Sediment Control” published by Empire State Chapter Soil and Water Conservation Society, under the direction of the New York State Department of Environmental Conservation, Division of Water.

2. General Soil Erosion and Sediment Control Measures:

    a. Take precautions to prevent mud from construction site accumulating on adjoining public roads and sidewalks and Owner's roads and sidewalks. Clean accumulations of mud from public roads and sidewalks and from Owner's roads and sidewalks when required by public authorities and when directed by Architect.

    b. Plan and execute construction by methods to control surface drainage from cuts and fills and from borrow areas, and to prevent erosion and sedimentation.

        1) Provide temporary measures and erosion control devices or methods appropriate to conditions at site.
        2) Construct fills and waste areas by selective placement to avoid erosive surface silts or clays.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

1. Maintain protection zones free of weeds and trash.

2. Do not prune roots or branches of trees to remain without approval of Architect.

    a. If pruning is approved, engage an experienced, qualified arborist to perform pruning and treating.

3. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction as environmentally safe.

G. Site Enclosure Fence (by Mechanical Contractor): Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations @ Chiller areas.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. **Furnish one set of keys to Owner.**

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

K. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.

1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.

2. Paint and maintain appearance of walkway for duration of the Work.

L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior. Face exterior enclosures with plywood, unless otherwise approved, in advance, by Architect. Polyethylene sheet may not be used for exterior enclosures.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

M. Temporary Fire Protection (by each trade): Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

A. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

B. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

C. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor.

2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

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 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.

2. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products.

1.4 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request.

   a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

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

B. The use of asbestos containing building materials is prohibited.

1. Contractor is responsible for providing closeout documentation certifying no asbestos containing building materials have been used in the Work.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for review and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Warranty periods related to Boilers and Accessory Equipment, and Air Conditioning Equipment do not begin until one year after the date of substantial completion.
3. See individual Specification Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Products:

a. Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

2. Manufacturers:

a. Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers, or a product by an unnamed manufacturer that complies with requirements. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

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 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Examination of conditions.
2. Preparation for construction.
3. Construction layout.
4. Field engineering and surveying.
5. Installation of the Work.
6. Cutting and patching.
7. Progress cleaning.
8. Starting and adjusting.
9. Protection of installed construction.
10. Correction of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

2. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

3. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."
B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Architect may issue "Construction Deficiency Report" for items identified by Architect as needing correction. Promptly repair or remove and replace defective construction identified in Construction Deficiency Report. Provide written notification to Architect when identified item has been corrected.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

SECTION 01 77 00 - CLOSEOUT PROCEDURES

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 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. All Submittals identified in Section 01 77 00 are classified as “Informational Submittals” in accordance with Specification Section 01 33 00.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

A. Submittals Prior to Substantial Completion: Complete the following before Contract-scheduled date of Substantial Completion:

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, electrical inspection reports, preliminary balance reports, and similar releases.

2. Submit notarized letter on Contractor’s letterhead certifying no asbestos containing building materials have been used in the Work. Also include a copy in the Operation and Maintenance Manuals.

3. Submit testing, adjusting, and balancing records. Also include a copy in the Operation and Maintenance Manuals.

4. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

B. Procedures Prior to Substantial Completion: Complete the following before Contract-scheduled date of Substantial Completion:

1. Advise Owner of pending insurance changeover requirements.

2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

3. Complete startup and testing of systems and equipment.

4. Perform preventive maintenance on equipment used prior to Substantial Completion. Maintenance to be performed by a factory authorized service representative so as not to void the equipment warranty.

5. Advise Owner of changeover in heat and other utilities.

6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

7. Complete all items on any Field Observation and Construction Deficiency Reports and submit a copy of the reports to the Architect and Construction Manager identifying how each item was addressed in detail, including the date of completion.

8. Complete final cleaning requirements as specified below, including touchup painting.

9. Repair and restore marred exposed finishes to eliminate visual defects.

10. Complete all items noted as requiring completion/correction from the Commissioning consultant and TAB (Testing and Balancing) consultant.

C. Inspection: No later than 14 days prior to the Contract-scheduled date of Substantial Completion, submit a letter to the Architect and Construction Manager confirming the work is ready for the Substantial Completion inspection. No later than seven days after Contract-scheduled date of Substantial Completion (including authorized adjustments), the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. Absent the Contractor letter confirming readiness of work, the Architect may elect to postpone the Substantial Completion inspection.

1. Additional Inspections: Request additional Substantial Completion inspections when the work that was not complete for the scheduled Substantial Completion inspection is now ready to inspect.

    a. Costs for such additional Substantial Completion inspections will be deducted from sums otherwise due the Contractor by deduct Change Order.

2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FUNCTIONAL COMPLETION PROCEDURES

A. Functional Completion applies to Contract Work being Commissioned. The commissioning of Divisions 01, 22, 23, and 26 (as applicable to each Contractor) must be complete prior to Functional Completion, except for the following:

1. Deferred Work approved in writing by the Architect.
2. Control system training planned to be performed after occupancy and final acceptance.

3. Any required seasonal TAB work to be formed during Warranty period.
4. Other approved deferred testing.

B. Completion of Commissioning required to demonstrate Functional Completion includes the following as applicable for all systems, but is not limited to:

1. Completed and signed pre-functional checklists and start-up documentation.
2. Requested trend logs complete, data and forms submitted and approved.
3. Completion of all functional testing.
4. Required training of Owner personnel completed and approved.
5. Submission of final approved TAB report.
6. Submission of final approved commissioning report.
7. Submission of the approved O&M manuals.
8. All identified deficiencies have been corrected or are approved in writing by the Owner to be excepted from this milestone.

C. The Architect will determine the date of Functional Completion after reviewing the Commissioning Agent's recommendation for Functional Completion.

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before final inspection for determining final completion, complete the following:

1. Submit copy of Architect's Substantial Completion inspection list of items to be completed or corrected. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance, what corrective action was taken, and the date of completion. Items that are in dispute shall have an explanation attached.

2. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."

3. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, property surveys, and similar final record information.

4. Submit closeout submittals specified in individual Specification Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

5. Submit maintenance material submittals specified in individual Specification Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable. All keys shall be tagged and labeled.

6. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

7. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."

B. Inspection: No later than seven days after the Contract-scheduled date for final completion, Architect and Construction Manager will proceed with the final completion inspection. The Architect will review the final Certificate for Payment after the inspection or will notify the Contractor of the outstanding items that must be completed or corrected before the certificate will be processed.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete has been completed or corrected. The Owner and Architect and Construction Manager reserve the right to add items to the Substantial Completion and final completion inspection lists as long as it is part of the Contractor's work. Complete all Contract requirements prior to the final completion inspection to avoid any further re-inspection cost.

a. Costs for such reinspections and any costs for extension of the Architect's and Construction Manager's services will be deducted from sums otherwise due the Contractor.

1.6 SUBMITTAL OF PROJECT WARRANTIES

A. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual. Warranties for all equipment, materials, and systems on the Project are to start no sooner than the date of substantial completion. Provide extended warranties for all equipment, materials, and systems that may have been turned over to the Owner for its use.

B. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit two digital media copies, PDF on thumb drive.

C. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

4. Submit two paper copies, as listed above.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Remove surface dust and dirt from all vertical and horizontal painted surfaces. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

g. Sweep concrete floors broom clean in unoccupied spaces using sweeping compound that is compatible with new finishes.

h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.

j. Remove labels that are not permanent.

k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

p. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to condition acceptable to Construction Manager.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

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 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Manual Format: Submit operation and maintenance manuals in the following format:

1. Two paper copies as listed below.
2. Two digital media copies, PDF format on thumb drive.

B. Prior to submission of paper copies and thumb drives as listed above, submit electronic files in PDF format for review and approval. If Submittal Exchange is used for Construction Document distribution, please upload O&M Manuals under the Submittals tab, Section 01 78 23. If the file is larger than 100MB, split said document into separate parts with a submittal cover sheet for each.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components

of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

4. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

B. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.5 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title Page: Include the following information:

   a. Subject matter included in manual.
   b. Name and address of Project.
   c. Date of submittal.
   d. Name and contact information for Contractor.

2. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

   a. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

3. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1.6 OPERATION AND MAINTENANCE MANUALS

A. Operation Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.

    a. Product name and model number. Use designations for products indicated on Contract Documents.
    b. Manufacturer's name.
    c. Equipment identification with serial number of each component.
    d. Equipment function.
    e. Complete nomenclature and number of replacement parts.

2. Operating Procedures: Include the following, as applicable:

    a. Startup procedures.
    b. Routine and normal operating instructions.
    c. Regulation and control procedures.
    d. Normal shutdown instructions.
    e. Seasonal and weekend operating instructions.
    f. Special operating instructions and procedures.

3. Emergency Procedures: Include the following, as applicable:

    a. Instructions on stopping.
    b. Shutdown instructions for each type of emergency.
    c. Operating instructions for conditions outside normal operating limits.
    d. Special operating instructions and procedures.

4. Wiring diagrams.

5. Control diagrams.

6. Piped system diagrams.

    a. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

7. Precautions against improper use.

8. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

9. Include copies of all inspections/tests required in the individual technical specifications section.

B. Maintenance Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, manufacturers' maintenance documentation, maintenance and service schedules, spare parts list and source information, maintenance service contracts, repair materials and sources, and warranties and bonds, as described below.

1. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

2. Product Information: Include the following, as applicable:

    a. Product name and model number.
    b. Manufacturer's name.
    c. Color, pattern, and texture.
    d. Material and chemical composition.
    e. Reordering information for specially manufactured products.

3. Maintenance Procedures: Include manufacturer's written recommendations and the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Schedule for routine cleaning and maintenance.
    e. Repair instructions.

4. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

    a. Standard maintenance instructions and bulletins.
    b. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
    c. Identification and nomenclature of parts and components.
    d. List of items recommended to be stocked as spare parts.

5. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

    a. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
    b. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

6. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

7. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

8. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

9. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

    a. Include procedures to follow and required notifications for warranty claims.

1.7 MANUAL PREPARATION

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

    1. Do not use original project record documents as part of operation and maintenance manuals.

D. Submittals: Include copy of each product submittal approved by Architect.

    1. If the “As-Specified Verification Form” was used as the product submittal, include all pertinent product data as described in this Section.

E. Safety Data Sheets (SDS): Include copy of SDS for each product installed.

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

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 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Miscellaneous record submittals.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Contractor to submit a full set of marked-up record drawings pertaining to their contract. Provide each drawing, whether or not changes and additional information were recorded. Comply with the following:

1. Submit one full size set of the original, marked-up record prints.

2. Submit two digital media copies, in color, in PDF format on thumb drives. PDFs to be saved and submitted as one file.

3. Prior to submission of paper copies and thumb drives as listed above, submit electronic files in PDF format for review and approval. If Submittal Exchange is used for Construction Document distribution, please upload Record Drawings under the Submittals tab, Section 01 78 39. If the file is larger than 100MB, split said document into separate parts with a submittal cover sheet for each.

B. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities.

1. Submit two paper copies of each submittal.

1.4 RECORD DRAWINGS

A. Record Prints: Architect will provide Contractor with one paper set of Contract Drawings at beginning of Work at no cost.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Revisions to routing of piping and conduits.
d. Revisions to electrical circuitry.
e. Locations of concealed internal utilities.
f. Changes made by Addendum.
g. Changes made by Architect's Supplemental Instruction (ASI) forms.
h. Changes made by Change Order or Construction Change Directive.
i. Changes made following Architect's written orders.

3. Mark record sets with red, permanent marker.

B. Record Digital Data Files: Prepare a full set of digital data files of the Contract Drawings from the marked-up record prints.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Indicate name of Contractor.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.

1.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.6 RECORDING AND MAINTENANCE

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's, Construction Manager's and Owner's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

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 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Instruction in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.3 CLOSEOUT SUBMITTALS

A. Attendance Record: For each demonstration and training session, submit list of participants, subjects covered, and length of instruction time.

B. Demonstration and Training Video Recordings: Submit two copies of each demonstration and training session.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name of Architect.
c. Name of Construction Manager.
d. Name of Contractor.
e. Name of service representative providing training.
f. Name of instructor.
g. Date of video recording.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training for each system and for equipment not part of a system, as required by individual Specification Sections. Include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

   a. System, subsystem, and equipment descriptions.
   b. Operating standards.

2. Documentation: Review the following items in detail:

   a. Manuals.
   b. Warranties and bonds.

3. Operations: Include the following, as applicable:

   a. Startup procedures.
   b. Routine and normal operating instructions.
   c. Regulation and control procedures.
   d. Safety procedures.
   e. Normal shutdown instructions.
   f. Operating procedures for emergencies.
   g. Seasonal and weekend operating instructions.
   h. Special operating instructions and procedures.

4. Adjustments: Include the following:

   a. Noise and vibration adjustments.
   b. Economy and efficiency adjustments.

5. Troubleshooting: Include the following:

   a. Diagnostic instructions.
   b. Test and inspection procedures.

6. Maintenance: Include the following:

   a. Types of cleaning agents to be used and methods of cleaning.
   b. Procedures for routine cleaning
   c. Procedures for preventive maintenance.
   d. Procedures for routine maintenance.

7. Repairs: Include the following:

   a. Diagnosis instructions.
   b. Repair instructions.

1.7 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.

1.8 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.

1. Submit video recordings on a flash drive.

B. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 79 00

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress.
3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

4. Review areas where existing construction is to remain and requires protection.

1.6 SUBMITTALS, GENERAL

A. General: Submit all informational submittals required by this Section concurrently.

1.7 INFORMATIONAL SUBMITTALS

A. Predemolition Photographs or Video: Show existing conditions, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit photos or video recordings on thumb drive before Work begins. Include copy of key plan indicating each photograph's or video's location and direction.

1. Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modification.
2. Photographs: Provide high-resolution color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels.

    a. Name each image with date photograph was taken, location, and unique sequential number keyed to accompanying key plan in file name.

3. Video: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels.

    a. Name each video recording with date video recording was recorded, location, and unique sequential number keyed to accompanying key plan in file name.
    b. Begin narration of each video recording with Contractor's name, videographer's name, and location in Project.

        1) Describe scenes on video recording by audio narration.
        2) Confirm date and time at beginning and end of recording.

1.8 CLOSEOUT SUBMITTALS

A. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.9 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.10 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.11 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition 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 Architect.

C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Record existing conditions by use of preconstruction photographs or video.

1. Inventory and record the condition of items to be removed and reinstalled. Provide photographs or video of conditions that might be misconstrued as damage caused by demolition operations.

E. Beginning selective demolition constitutes Contractor's acceptance of conditions.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Reinstalled Items:

1. Clean and restore items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and restoring. Identify contents of containers.
3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 02 65 00 - UNDERGROUND STORAGE TANK PERMANENT CLOSURE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Permanently closing underground fuel tank by removal.
2. Disconnecting, capping or sealing, and abandoning in-place fuel tank piping.
3. Performing a site assessment of the existing installation.

1.3 DEFINITIONS

A. Inerting: The displacement of oxygen (and the incidental removal of some vapors) to deprive a potential fire of a source of oxygen.
B. Purging: The removal of flammable vapors from a tank to deprive a potential fire of any fuel source.
C. UST: Underground storage tank.

1.4 INFORMATIONAL SUBMITTALS

A. Laboratory analysis reports for soil and groundwater samples taken.
B. Site Assessment Report.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Mylars: Comply with requirements of Section 01 31 00 “Project Management and Coordination” and as modified below.

1. Conform to the requirements outlined in 6NYCRR Part 613.
2. Include a statement that the Permanent Tank Closure meets all applicable State, Federal and Local Requirements.
3. Include locations of samples taken for field and laboratory analysis.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA Flammable and Combustible Liquids Code (NFPA #30, #30A and #17, latest editions).

B. Comply with requirements of the New York State Department of Environmental Conservation (NYSDEC) SPOTS Memo No. 14 – Site Assessments at Bulk Storage Facilities.
C. Comply with requirements of "Closure of Underground Petroleum Storage Tanks," API Recommended Practice 1604 (1996).
D. Comply with requirements of “Assessment and Remediation of Underground Petroleum Releases,” API Publication 1628.
E. Comply with requirements of the EPA and of state and local authorities having jurisdiction. Include recording of fuel-oil storage tanks.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIAL

A. Stockpile excavated materials for backfill. Refer to Section 31 20 00 " Earth Moving" for additional fill materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Evaluate site to determine the potential for encountering contaminated backfill, soil, or groundwater that may require special handling.

B. If during the tank closure process product or product contaminated soil or ground water is discovered, stop closure process and alert Owner’s representative.

1. If petroleum is present in the soil then it must be reported as a spill to the DEC within two hours. The presence of product may require the installation of one or more ground water monitoring/recovery wells or removal of the tank to take remedial action to clean up the site. Comply with all NYSDEC requirements for contamination remediation.

C. Coordinate with the Owner and the Owner’s Representative to identify an area for stockpiling excavated backfill and soils.

3.2 EARTHWORK

A. Comply with requirements in Section 31 20 00 " Earth Moving" for excavating, trenching, and backfilling.

3.3 PREPARATION

A. Notify the Regional NYSDEC office a minimum of 30 days prior to commencing with tank closure work. This is done by modifying the registration information for the facility on the bulk storage registration application forms supplied by the Owner. Call the regional office to inform the regional bulk storage staff at least three (3) days before commencing with the closure and notify them of the actual date and time of the work.

B. All liquids and residues removed from the tank shall be tested and handled in accordance with appropriate federal, state and local regulations.

C. Comply with NFPA 30 and NFPA 31 requirements for prevention of accidental ignition.

D. Close equipment shutoff valves before disconnecting fuel oil piping.

E. Drain all usable product from piping back into tank.

F. The Owner shall remove usable product in tank to its lowest draw-off point. Remove any residual fuel from the tank.

G. Flush supply and return piping into the tank with a minimal amount of water. No more than 1 gallon of water per 10 feet of NPS 1-1/2 piping or 2 gallons of water per 10 feet of NPS 2 piping should be used.

H. Clean the tank interior with a high-pressure rinse using as little water as possible to remove loose scale, corrosion and residual product. In the case of a fuel oil storage tank where large amounts of sludge and/or tar may be present, it may be necessary to enter the tank and manually remove such wastes. Cleaning by brushing, shoveling and/or scraping may also be required to clean the inside of the tank.

I. Take all necessary safety precautions while cleaning the tank interior and recovering the wastes and drumming them for proper disposal.

J. Pump out any remaining liquid below the draw-off point by use of a hand pump or a vacuum pump (non-sparking) and dispose of the wastewater generated by this process in accordance with solid and/or hazardous waste regulations.

K. Modify the existing tank vent to ensure the displacement of tank vapors caused by purging and inerting process are at least 12 feet above grade and 3 feet from any adjacent roof area.

L. Excavate to expose the entire top of the tank. Stockpile excavated materials for backfilling in designated location. Separate and concrete, asphalt and piping from the excavated backfill and soil.

M. Disconnect the fill pipe, gauge pipe, vapor recovery truck connection, submersible pumps or other tank fixtures and all product lines. Cap or plug open ends of lines which are not to be used further to ensure so all vapors exit through the vent line during the vapor-freeing process.

N. Leave the vent line connected until the tank is rendered vapor free.

O. Ensure the work area is free of any ignition sources.

3.4 PURGING AND INERTING PROCESS

A. Purging: Use one of the following methods to render the tank safe. In all methods, the tank atmosphere should be checked to ensure that petroleum vapors have been satisfactorily purged from the tank.

1. Dry Ice; 1.5 pounds per 100 gallons of tank capacity. The dry ice should be crushed and distributed evenly over the greatest possible area of the tank's interior. As the dry ice vaporizes flammable vapors will flow out of the tank. Therefore, observe all safety precautions regarding flammable vapors.

2. Carbon Dioxide (CO_2); an alternative to dry ice is to introduce CO_2 gas directly into the tank (via the fill line) to purge flammable vapors. A minimum of one 75 pound cylinder of CO_2 gas per 2,000 gallons of tank volume should be used. Care must be exercised to prevent buildup of any static charge. The nozzle must be bonded or grounded and the gas introduced slowly to reduce static.

3. Nitrogen; Vapors within the storage tank must be displaced with an amount of nitrogen gas equal to or greater than the volume of the tank atmosphere. Bond or ground the nozzle or hose to prevent static buildup.

B. Inerting: Ventilate the tank with compressed air through a diffused air blower pipe. Properly bond the air-diffusing pipe to prevent the discharge of a spark. Ensure compressor is providing a clean air supply that is free of volatile vapors. Air pressure in tank shall not exceed 5 psig per square inch gauge.

C. Control ignition sources during tank purging and inerting operations regardless of the chosen method.

D. Test the tank atmosphere with an oxygen meter to ensure that the tank is safe. The oxygen meter will give a reading of % oxygen per volume. A reading of 6 - 7% oxygen is considered a safe condition.

E. Repeat the purging and inerting processes until the tank atmosphere tests safe.

3.5 TANK REMOVAL

A. As soon as the petroleum vapors are satisfactorily purged from the tank, remove the vent connection. Cap and plug the abandoned vent pipe.

B. Plug or cap all holes in the tank before moving tank from site. Leave a 1/8-inch vent hole in one of the plugs to prevent the tank from being subjected to excessive pressure differential caused by extreme temperature changes.

C. Excavate around the tank to uncover for removal. Remove the tank from the excavation and place the tank on a level surface and block the tank to prevent movement.

D. Perform the site assessment in the open excavation.

E. Clean the interior of the tank or move the tank to a tank storage yard for cleaning.

F. Test the tank atmosphere immediately before the tank is removed from the site to ensure the tank is safe for transport. If combustible gas indicator reading is higher than allowable levels, purge vapors from tank as indicated in "Purging and Inerting Process" Article above.

G. Secure the tank on a truck for transport, ensuring the vent hole is located at the uppermost point of the tank.

H. If tank is not cut up or crushed on site, paint label on tank after removal from ground, but prior to removal from site.

I. Label tank with the following information in legible letters at least 2 inches high.

"TANK HAS CONTAINED FUEL OIL
NOT VAPOR FREE
NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR
HUMAN OR ANIMAL CONSUMPTION
DATE OF REMOVAL: MONTH/DAY/YEAR"

J. Remove tank from site as promptly as possible after vapor-freeing procedures have been completed. Transport tank in accordance with all local, state and federal regulations.

3.6 SITE ASSESSMENT

A. Perform a Phase I Site assessment of the installation in accordance with the NYSDEC SPOTS Memo No. 14 – Site Assessments at Bulk Storage Facilities.

B. Continuously observe the excavation work closely for signs of contamination; stained soil, smelling for chemical or petroleum odors, looking for signs of sheen on water surface. Document field observations and include in the site assessment record.

C. Perform a bucket test or jar test on a sample of the excavated material. Mix a small quantity of excavated soil in a bucket or jar and clean water. Allow the mixture to settle. Observe the water surface for evidence of sheen. Document field observations and include in the site assessment record.

D. Utilize field instruments such as explosimeters, combustible gas indicators, photoionization detectors, flame ionization detectors, organic vapor analyzers, and/or colorimetric reading tubes as required for on-the-spot analyses for contamination.

E. Sampling for field analysis:

1. Take a minimum of three (3) borings around the tank to groundwater or bedrock. Take soil samples at each boring from a split spoon at 5 feet intervals to a depth of 3 to 6 feet 10 feet 10 feet below the tank bottom until ground water or bedrock is encountered. If ground water is encountered, take a groundwater sample from each boring. Take a final sample at the soil/water or soil/bedrock interface.

    a. If the field instruments do not indicate any signs of contamination in the samples taken, then only send the final sample at the soil/water or soil/bedrock interface to the lab for analysis.

2. Take a sample every 20 feet along the pipe run (or at every joint, if known) and analysis with a field instrument.

3. Utilize headspace analysis for analyzing soil and water samples taken. This involves putting the samples in a jar or bag, sealing it, and after a period of time, analyzing the vapor space in the top of the jar or bag with the field instruments listed above. Document field observations and include in the site assessment record.

F. Sampling for lab analysis:

1. Coordinate lab sampling schedule with a State Certified Testing Laboratory well in advance of work to avoid delays in the schedule. Consult with the lab as to the number and types of samples required for the type of analysis to be done, type of report that is expected and how long it will take to get the results.

2. Ensure proper care and custody of the samples is taken. Sampling procedures including number, type, location, retrieval, care, custody, and analysis samples are thoroughly discussed in the API Publication 1628 “Assessment and Remediation of Underground Petroleum Releases”.

3. If the field instruments do not indicate any signs of contamination in the boring samples taken, then only send the final sample at the soil/water or soil/bedrock interface to the lab for analysis.

4. Prepare a site assessment report that documents how the site assessment was performed, where the samples were taken, dates they were taken, who took them, types of samples, depth of samples, field analysis results and lab analysis reports.

5. Include a photographic record of the site assessment work performed in the report.

6. Include in the report the date of tank closure in place, the method of conditioning the tank for closure in place and the material used to fill the tank.

3.7 SITE RESTORATION

A. Backfill and fill excavation with stockpiled excavation material, clean sand or pea gravel in accordance with Section 31 20 00 "Earth Moving" after the NYSDEC Inspector has approved the hole as clean.

B. Restore disturbed grade to match existing in accordance with Section 31 20 00 " Earth Moving".

END OF SECTION 02 65 00

SECTION 03 30 53 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, accessories, placement procedures, and finishes.

1.3 SUBMITTALS

A. Action Submittals:

1. Product Data: For each type of product indicated.
   a. Fibrous reinforcement.
   b. Penetrating silane sealer.
   c. Chemical anchor adhesives.
   d. Curing compound.
   e. Corrective overlayment (industry name is Repair Overlayment).

2. Design Mixtures: For each concrete mixture.

   a. Indicate amounts of mixing water to be withheld for later addition at Project site.
   b. Include compressive strength test reports.
   c. Include all ingredient certifications and product data concurrently.

3. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

B. Informational Submittals:

1. Proposed curing method for all concrete elements.

1.4 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Comply with the following sections of ACI 301, unless modified by requirements in the Contract Documents:

1. "General Requirements."
2. "Formwork and Formwork Accessories."
3. "Reinforcement and Reinforcement Supports."
4. "Concrete Mixtures."
5. "Handling, Placing, and Constructing."

C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.1 FORMWORK

A. Furnish formwork and formwork accessories according to ACI 301.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For exterior concrete, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, Type I or Type II.

a. Fly Ash: ASTM C 618, Class C or F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates:

1. ASTM C 33, Class 4S coarse aggregate or better, graded, for exterior concrete. Provide aggregates from a single source.

2. Maximum Coarse-Aggregate Size:

   a. All other concrete: 1 inch nominal.

3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

D. Synthetic Macro-Fiber: Polyolefin macro-fibers (containing no reprocessed olefin materials) engineered and designed for use as secondary reinforcing in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 1/4 to 2-1/4 inches long, varying fiber thickness, and no water absorption.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. Mid-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type A or Type F. Water content reduction to be greater than 7%.
5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 RELATED MATERIALS

A. Penetrating, Silane Sealer: Single component, minimum 40% silane, waterbased slab sealer that forms chemical bond to the concrete. VOC compliant.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Chem Masters; Aquanil Plus 40.
   b. Dayton Superior Corporation; Weather Worker 40% J29WB.
   c. Sika Corporation; Sikagard H 400.

B. Chemical Anchor Adhesives: Heavy duty, two component injectable adhesive designed to be dispensed using double chamber gun with mixing nozzle. Adhesives in capsule form will not be accepted.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. DeWalt; AC200+.
b. Hilti, Inc.; HIT-HY 200R; HIT-HY 200A; HIT-ICE.
c. ITW Redhead; A7+.

2.7 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1-D, Class B, dissipating, with fugitive dye.

2.8 RECONSTRUCTION AND CORRECTIVE MATERIALS

A. Corrective Overlayment (Industry name is Repair Overlayment): Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations. For thicker applications manufacturer's recommendations to extend mix with an aggregate may apply.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5,000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.9 CONCRETE MIXTURES

A. Comply with ACI 301 requirements for concrete mixtures.

B. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in all concrete. Design mix for optimum placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use a mid-range, water-reducing admixture in pumped concrete, all concrete slabs (including concrete walks), concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

C. Exterior Concrete: For concrete elements at the exterior of the building, including but not limited to slabs (concrete walks, ramps, stairs, pads), curbs and architectural concrete elements, proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 5000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.40.
3. Slump Limit: 4 inches, plus or minus 1 inch; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size. Applies to all exterior concrete other than slabs on grade.
5. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture, at concrete batch facility, at manufacturer's recommended rate, but not less than 3.0 lb/cu. yd..

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116, and furnish batch ticket information.

1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade conditions are satisfactory prior to forming or pouring concrete. Owner’s Testing Agency shall inspect slab and footing subgrade prior to placing concrete.
B. Verify that reinforcing is properly in place prior to pouring concrete.
C. Verify that formwork is complete and properly secured prior to placing concrete.
D. Proceed with installation only after unsatisfactory conditions have been corrected.
E. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 FORMWORK

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.3 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.4 STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Locate and install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3.6 CONCRETE PLACEMENT

A. Comply with ACI 301 for placing concrete.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, (4.3.2.1 Slump Adjustment.)

1. With each concrete mixture submittal, indicate amounts of mixing water to be withheld for later addition at Project site.
2. Water added must not increase the water-cement ratio past the approved mix design ratio.
3. Add additional water reducer or plasticizer to mix instead of adding water to achieve flowable, workable concrete. Do not add water to concrete after adding these admixtures to mixture.
4. Do not add water after truck is more than half empty.

C. Consolidate concrete with mechanical vibrating equipment.

D. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4,000 psi at 28 days.

4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas corrected and patched. Remove fins and other projections exceeding 1/2 inch.

1. Apply to concrete surfaces not exposed to public view.

3.8 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.

1. Do not further disturb surfaces before starting finishing operations.

C. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view.

1. **For fiber reinforced concrete**, to provide consolidation and bury surface fibers, open slab surfaces to be struck off with a vibrating screed or laser screed. Where a laser screed is used, adjust the magnitude of vibration and control the speed of the refracting leveling head to ensure adequate consolidation of the concrete and embedment of the fibers. Magnesium floats in the form of a bullfloat, channel radius float, or highway straightedge to be used to establish a surface and close tears or open areas. **Do not use wood floats.**

E. Exterior Concrete: Apply penetrating, silane sealer per manufacturer's instructions.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Begin curing after finishing concrete but not before free water has disappeared from concrete surface. Protect all slabs from precipitation accumulation.

C. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately correct any holes or tears during curing period using cover material and waterproof tape.

a. Use for all interior equipment pads.
b. Use for all items to receive penetrating silane sealer.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Contractor to supply all batch tickets to Owner's testing agency. Batch tickets to note w/c ratio and amount of water allowed to be added at Project site.

C. Tests: Perform according to ACI 301. Include Unit Weight: ASTM C 138, fresh unit weight of concrete. Two tests per truck load; one at beginning of pour and near end of pour.

1. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
2. Include corresponding concrete mix batch tickets with each test report.
3. Indicate amount of water added to batch at Project site.

3.11 CORRECTIVE WORK

A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION 03 30 53

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Face brick.
3. Mortar and grout.
4. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Cavity wall insulation.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. CMUs.
2. Face brick, to match existing
3. Portland cement.
4. Aggregate for mortar.
5. Proprietary cleaner.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "**As-Specified Verification Form**" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:
1. CMUs.

2. Face brick.
3. Compressible filler.

C. Samples for Verification: For each type and color of the following:

1. Face brick, in the form of straps of five or more bricks.
2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.6 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C67.

B. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

A. CMUs: ASTM C90.

1. Density Classification: Lightweight unless otherwise indicated.
2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
3. Exposed Faces: Provide uniform fine texture units suitable for painting.

B. Concrete Building Brick: ASTM C55.

1. Density Classification: Lightweight.
2. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

2.5 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
2. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
3. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: Facing brick complying with ASTM C216.

1. Basis-of-Design Product: Match existing
2. Grade: SW.
3. Type: FBX.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C67.
5. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."

6. Size: Match existing
7. Application: Use where brick is exposed unless otherwise indicated.
8. Where shown to "match existing" provide face brick matching color range, texture, and size of existing adjacent brickwork.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

C. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated.

a. Color: Match existing

2. Pigments shall not exceed 10 percent of portland cement by weight.

D. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Aggregate for Grout: ASTM C404.

F. Water: Potable.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Hohmann & Barnard, Inc.; NS – Closed Cell Neoprene Sponge.

b. Wire-Bond; #3300 Expansion Joint.

B. Proprietary Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Prosoco, Inc.

2.8 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For concrete masonry unit backup in exterior walls, masonry bearing walls, shear walls and masonry below grade or in contact with earth, use Type S. Not for use in masonry veneer construction.
2. Use Type N mortar in all masonry veneer construction and in all masonry construction other than noted in the requirements for Type S mortar above.

D. Pigmented Mortar: Use colored cement product.
1. Application: Use pigmented mortar for exposed mortar joints with the following units:

a. Face brick.

E. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that foundations are within tolerances specified.
2. Verify that reinforcing dowels are properly placed.
3. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

D. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

E. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
   1. Match existing lines, levels, and joints to within 1/16 inch.

3.4 LAYING MASONRY WALLS

A. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

B. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

   1. Bed face shells in mortar and make head joints of depth equal to bed joints.
   2. Bed webs in mortar in all courses of piers, columns, and pilasters.
   3. Bed webs in mortar in grouted masonry, including starting course on footings.
   4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
   5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

E. Cut joints flush where indicated to receive air barriers unless otherwise indicated.

3.6 CAVITY WALLS

A. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity.

B. Install air barrier system to comply with Division 07 Section “Fluid-Applied Membrane Air Barriers.”

C. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation, air barrier, and masonry.

3.7 MASONRY VENEERS

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace.

3.8 CORRECTING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

END OF SECTION 04 20 00

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-retardant-treated materials, including plywood backing panels.
2. Miscellaneous lumber (non-treated).

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Fire-Retardant-Treated Materials:

a. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
b. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
c. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.

2. Dimension lumber framing (non-treated).

3. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664 and design value adjustment factors shall be calculated according to ASTM D6841.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Dimension Lumber Items: Construction or No. 2 grade.

1. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.
d. Spruce-pine-fir; NLGA.
e. Douglas fir-south; WWPA.
f. Hem-fir; WCLIB or WWPA.
g. Douglas fir-larch (north); NLGA.
h. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

G. Application: Treat following items:

1. Concealed blocking.
2. Plywood backing panels.

2.3 MISCELLANEOUS LUMBER (NON-TREATED)

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.
4. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.

5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine or southern pine; No. 3 grade; SPIB.
2. Hem-fir or hem-fir (north); Standard or No. 3 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir; Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

1. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.5 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cleveland Steel Specialty Company.
2. Simpson Strong-Tie Company Inc.

B. Allowable design loads, as published by manufacturer, shall meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

E. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.

1. Use for exterior locations and where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Do not splice structural members between supports unless otherwise indicated.

G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not

inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.

3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.

I. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

J. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

K. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in New York State Building Code.
2. ICC-ES evaluation report for fastener.

L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

1. Provide 1/4-inch vent space between each length of blocking.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 INSTALLATION OF WOOD FURRING

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

END OF SECTION 06 10 00

SECTION 06 74 13 – FIBERGLASS REINFORCED GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glass-fiber-reinforced plastic gratings.

1.3 COORDINATION

A. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

B. Action submittals

1. Product Data: For the following:

   a. Glass-fiber-reinforced plastic gratings.
   b. Clips and anchorage devices for gratings.

2. Shop Drawings: Include plans, sections, details, and attachments to other work.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. All American Grating.
2. Fibergrate Composite Structures Inc.
3. Strongwell Corporation.

2.2 GLASS-FIBER-REINFORCED PLASTIC GRATINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. All American Grating.
2. American Grating, LLC.
3. Fibergrate Composite Structures Inc.
4. Strongwell Corporation.

B. Molded Glass-Fiber-Reinforced Gratings: Bar gratings made by placing glass-fiber strands that have been saturated with thermosetting plastic resin in molds in alternating directions to form interlocking bars without voids and with a high resin content.

1. Configuration: 1-1/2-inch-square mesh, Verify existing thickness in field.
2. Weight: As required to meet configuration, dimensions, and strength.
3. Resin: Vinylester.

a. Flame-Spread Index: 25 or less when tested according to ASTM E 84.

4. Color: Manufacturer's standard.
5. Traffic Surface: Plain

2.3 FASTENERS

A. General: Unless otherwise indicated, provide **Type 304** stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

D. Plain Washers: Round, ASME B18.22.1.

E. Lock Washers: Helical, spring type, ASME B18.21.1.

2.4 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

F. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Fit exposed connections accurately together to form hairline joints.

3.3 INSTALLING GLASS-FIBER-REINFORCED PLASTIC GRATINGS

A. Comply with manufacturer's written instructions for installing gratings. Use manufacturer's standard stainless-steel anchor clips and hold-down devices for bolted connections.

END OF SECTION 06 74 13

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam.
2. Insulation for miscellaneous voids.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "**As-Specified Verification Form**" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Closed-cell spray polyurethane foam.
2. Thermal barrier intumescent coating.
3. Insulation for miscellaneous voids.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For closed-cell, spray polyurethane foam insulation.

1.6 QUALITY ASSURANCE

A. Spray Polyurethane Foam Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Identification: Identify product R-values with manufacturer's markings, or certification, in accordance with requirements of building Code in effect for the Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 2 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

   a. Gaco Western LLC; GacoWallFoam 183M.
   b. Lapolla Industries, Inc.; Foam-Lok 2000-4G.

2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

B. Miscellaneous Materials:

1. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

2. Membrane at Transitions: Provide membrane at transitions in substrate and connections to adjacent elements acceptable to the spray polyurethane foam manufacturer.

3. Thermal Barrier Intumescent Coating: Intumescent water-based, spray-applied coating that has been tested and approved for use in a building interior as a 15-minute alternative thermal barrier complying with New York State Code and New York State VOC regulations. Use only products that have been tested and approved for use with spray polyurethane foam to be used; provide primer as required.

   a. Basis-of-Design Product: Subject to compliance with requirements, provide International Fireproof Technology, Inc.; DC315, or comparable product.

2.2 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Spray Polyurethane Foam Insulation for Miscellaneous Voids: ASTM C 1029, Type II, closed cell, minimum density of 1.75 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.0 deg F x h x sq. ft./Btu at 75 deg F, with maximum flame-spread and smoke-developed indexes of 25 and 400, respectively, per ASTM E 84.

      a. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont; Froth-Pak Foam Insulation, or comparable product.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the Work.

B. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation, or that interfere with insulation attachment.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Install insulation so that manufacturer’s R-value mark is readily observable, in accordance with requirements of building Code in effect for the Project.

3.3 INSTALLATION OF SPRAY FOAM INSULATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

C. Comply with insulation manufacturer's written instructions applicable to products and applications.

D. Prior to application, bridge gaps in construction at changes in substrate plane or changes in adjoining materials as recommended by manufacturer.

E. Spray insulation to envelop entire area to be insulated and fill voids.

F. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer.

G. Apply thermal barrier intumescent coating in accordance with manufacturer’s written instructions and at the required dry film thickness per the applicable spray foam evaluation report.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vapor-retarding, fluid-applied air barriers.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

1. Accessory materials.
2. Stainless-steel sheet.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "**As-Specified Verification Form**" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. High-build, vapor-retarding air barrier.

C. Sustainable Design Submittals:

1. Product Data: For coatings, indicating VOC content.

D. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates, Compatibility: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

B. Product Certificates, Fire Propagation Characteristics: From a qualified testing agency, documenting that air barrier system as a component of the indicated wall assembly has been tested and passed NFPA 285.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

B. VOC Content: 100 g/L or less.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E2357.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

A. High-Build, Vapor-Retarding Air Barrier: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 40 mils or thicker over smooth, void-free substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the Work, include, but are not limited to:

a. Carlisle Coatings & Waterproofing; Fire Resist Barritech NP.
b. Henry Company; Air-Bloc 16MR.
c. Meadows, W. R., Inc.; Air-Shield LSR.
d. Tremco, Inc., Commercial Sealants and Waterproofing Division, an RPM company; ExoAir 130.

2. Physical and Performance Properties:

a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E2178.
b. Vapor Permeance: Maximum 0.1 perm; ASTM E96/E96M, Desiccant Method.
c. Ultimate Elongation: Minimum 270 percent; ASTM D412, Die C.
d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D4541.
e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Stainless-Steel Sheet: ASTM A240/A240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints discontinuous with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

2. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to other construction used in exterior wall openings, using accessory materials.

C. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

D. Fill gaps in perimeter of miscellaneous penetrations of air-barrier material with foam sealant.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness not less than 40 mils.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; correct substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.

2. Air-barrier dry film thickness.

3. Continuous structural support of air-barrier system has been provided.

4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.

5. Site conditions for application temperature and dryness of substrates have been maintained.

6. Maximum exposure time of materials to UV deterioration has not been exceeded.

7. Surfaces have been primed, if applicable.

8. Compatible materials have been used.

9. Transitions at changes in direction and structural support at gaps have been provided.

10. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.

11. All penetrations have been sealed.

C. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

D. Correct damage to air barriers caused by testing; follow manufacturer's written instructions.

E. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after correcting and preparing the overexposed materials according to air-barrier manufacturer's written instructions.

2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Penetrations in fire-resistance-rated walls.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

C. Product Schedule: For each penetration firestopping system. Include type of penetration, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with listed system designs published by a qualified testing agency.

1) UL in its online directory "Product iQ."

2.3 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems are to be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. 3M Fire Protection Products.
    b. Hilti, Inc.
    c. RectorSeal, a CSW Industrials company.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479.

1. F-Rating: Not less than the fire-resistance rating of the wall penetrated.

C. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

1. Verify sealant has a VOC content of 250 g/L or less.

D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.4 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric strips for use around combustible penetrants.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Compressible, removable, and reusable intumescent pillows encased in fire-retardant polyester or glass-fiber cloth. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.5 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION OF PENETRATION FIRESTOPPING SYSTEMS

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.6 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to UL system numbers in its online directory "Product iQ" under product Category XHEZ.

B. For each location where a penetration occurs, provide a firestopping system selected from the wall system below that complies with this Section and is suitable for the penetration conditions indicated for the Project.

WALL Firestopping Systems Listed Using the Alpha-Alpha-Numeric Identification System Published in UL's *Fire Resistance Directory*, Vols. 2a - 2b				
TYPE OF PENETRANT	Wall PENETRATION SYSTEMS (First Alpha Component = C or W)			
	Concrete or Masonry Walls with a Minimum Thickness Less Than or Equal to 8 Inches (203 MM)	Concrete or Masonry Walls with a Minimum Thickness OF MORE Than 8 Inches (203 MM)	Framed Walls	Composite panel walls
NO PENETRATING ITEMS	C-AJ-0001-0999, C-BJ-0001-0999, or W-J-0001-0999		W-L-000-1-0999	
METALLIC PIPE, CONDUIT, OR TUBING	C-AJ-1001-1999, C-BJ-1001-1999, or W-J-1001-1999	C-BK-1001-1999 or W-K-1001-1999	W-L-1001-1999	W-N-1001-1999
NONMETALLIC PIPE, CONDUIT, OR TUBING	C-AJ-2001-2999, C-BJ-2001-2999, or W-J-2001-2999	C-BK-2001-2999 or W-K-2001-2999	W-L-2001-2999	W-N-2001-2999
ELECTRICAL CABLES	C-AJ-3001-3999, C-BJ-3001-3999, or W-J-3001-3999	C-BK-3001-3999 or WK-3001-3999	W-L-3001-3999	
CABLE TRAYS WITH ELECTRICAL CABLES	C-AJ-4001-4999, C-BJ-4001-4999, or W-J-4001-4999	W-K-4001-4999	W-L-4001-4999	

WALL Firestopping Systems Listed Using the Alpha-Alpha-Numeric Identification System Published in UL's *Fire Resistance Directory*, Vols. 2a - 2b				
TYPE OF PENETRANT	Wall PENETRATION SYSTEMS (First Alpha Component = C or W)			
	Concrete or Masonry Walls with a Minimum Thickness Less Than or Equal to 8 Inches (203 MM)	Concrete or Masonry Walls with a Minimum Thickness OF MORE Than 8 Inches (203 MM)	Framed Walls	Composite panel walls
INSULATED PIPES	C-AJ-5001-5999, C-BJ-5001-5999, or W-J-5001-5999	C-BK-5001-5999	W-L-5001-5999	W-N-5001-5999
MISCELLANEOUS ELECTRICAL PENETRANTS	C-AJ-6001-6999, C-BJ-6001-6999, or W-BJ-6001-6999		W-L-6001-6999	
MISCELLANEOUS MECHANICAL PENETRANTS	C-AJ-7001-7999, C-BJ-7001-7999, or W-J-7001-7999		W-L-7001-7999	W-N-7001-7999
GROUPINGS OF PENETRATIONS	C-AJ-8001-8999, C-BJ-8001-8999, or W-J-8001-8999		W-L-8001-8999	

END OF SECTION 07 84 13

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

1. Cylindrical sealant backings.
2. Primers.

B. As-Specified Data: If the product to be incorporated into Project is as specified by manufacturer name and product designation in Part 2 of this Specification Section, submit the "**As-Specified Verification Form**" (attached to Division 01 Section "Submittal Procedures") for each item listed below, otherwise submit full Product Data for the following:

1. Silicone joint sealants.

C. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each product exposed to view.

E. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.5 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content: Sealants and sealant primers shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous surfaces shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range. Multiple colors may be selected.

2.2 SILICONE JOINT SEALANTS

A. Silicone Joint Sealants: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); DOWSIL790 Silicone Building Sealant.
b. GE/Momentive Performance Materials Inc.; SCS2700 SilPruf LM.
c. Pecora Corporation; 890NST.
d. Tremco Incorporated; Spectrem 1.

2. Joint-Sealant Application: Joints in vertical surfaces.

a. Exterior Joint Locations:
1) Perimeter joints of exterior penetrations.

2) Other joints as indicated.

b. Interior Joint Locations:

1) Perimeter joints of exterior penetrations.
2) Other joints as indicated.

2.3 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type O (open-cell material) or either of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.

3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and correct damaged or deteriorated joint sealants immediately so installations with corrected areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 09 91 00 – PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and application of paint systems, for the following:

1. Interior applications.

a. Paint to match existing wall systems.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product for substrates indicated. Include preparation requirements and application instructions. Include all paint products under one cover sheet.

1. Interior CMU.
2. Interior steel piping, piping supports and hangers.
3. Interior galvanized-metal.
4. Interior gypsum board.
5. Interior insulation-covering.

B. LEED Submittals:

1. Product Data for Credit EQ 4.2: For interior finishes, documentation including printed statement of VOC content.

2. Laboratory Test Reports for Credit EQ 4: For interior finishes, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Samples for Verification and Initial Color Selection: For each type of finish system and in each color and gloss of finish indicated.

1. Submit Samples on rigid backing, 8 inches square.

2. Step coats on Samples to show each coat required for system.

3. Label each coat of each Sample.

4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings.
2. VOC content. Tints and /or colorant shall add no additional VOC to final product. Provide 3rd party certification of VOC content.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For applicator.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 10 percent, but not less than 1 gal. of each material and color applied.
2. Stains and Transparent Finishes: 10 percent, but not less than 1 gal. of each material and color applied.

1.7 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual, experienced in applying finishes specified in this Section, who has successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; familiar with special requirements indicated; and with sufficient trained staff to apply manufacturer's products according to specified requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.

B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.
3. Sherwin-Williams Company (The).

B. Submittals containing manufactures other than stated above, will require a product by product comparison for each type of paint. All Comparable equals are to be matched with corresponding Sherwin Williams specified products.

C. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in Part 3 articles for the application indicated.

2.2 MATERIALS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

3. Provide products of same manufacturer for each coat in a finish system.

4. “All-in-one” paint and primer products are not acceptable.

B. VOC Compliance: All paint products shall meet New York requirements for Volatile Organic Compound (VOC) and Ozone Transport Commission (OTC) regulations, January 2005.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior coatings applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.

7. Pre-Treatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L
10. Shellacs, Clear: 730 g/L.
11. Shellacs, Pigmented: 550 g/L.
12. Stains: VOC not more than 250 g/L.

D. Low-Emitting Materials: Interior finishes shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Colors: As selected by Architect from manufacturer's full range. Match existing where indicated on drawings and for repair to existing finishes.

1. 25 percent of surface area will be painted with deep tones.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

a. Concrete: 12 percent.
b. Masonry (Clay and CMU): 12 percent.
c. Gypsum Board: 12 percent.

B. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be finished. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

B. Clean substrates of substances that could impair bond of finishes, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce finish systems indicated.

C. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following**:**

1. SSPC-SP 3, "Power Tool Cleaning."
2. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

G. Alteration Work: Comply with applicable surface preparation requirements specified and as recommended by finish materials manufacturer for existing surfaces to receive paint or other finishes, including cleaning, sanding, and roughening as required for proper adherence of new finish material.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions.

1. Use applicators and techniques suited for finish and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

4. Do not apply paints over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

E. Alterations: Finish new surfaces adjacent to unaltered existing surfaces with finish of same type and surface texture as corresponding adjacent surfaces, unless otherwise indicated. Finish patched, damaged, or extended surfaces to match existing surfaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished surfaces.

3.6 **INTERIOR PAINTING SCHEDULE**

A. Concrete Substrates, Vertical Surfaces:

1. First Coat:

a. Benjamin Moore & Co.; Ultra Spec N609 Int/Ext High Build Masonry Primer.
b. PPG Paints: Perma-Crete Alkali-Resistant Primer 4-603.
c. Sherwin-Williams Company (The); Loxon Concrete & Masonry Primer (LX02W0050.)

2. Second and Third Coats (Semi-Gloss):

a. Benjamin Moore & Co.; T546 Ultra Spec 500 Interior Semi-Gloss.
b. PPG Paints: Speedhide Interior Semi-Gloss Latex 6-500.

c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex S/G B31 Series.

B. CMU Substrates:

1. First Coat:

a. Benjamin Moore & Co.; Super Spec Masonry Int-Ext Hi-Build Block Filler 571.
b. PPG Paints: Speedhide Interior/Exterior Latex Block Filler 6-7.
c. Sherwin-Williams Company (The); PrepRite Block Filler B25W25

2. Second and Third Coats (Semi-Gloss):

a. Benjamin Moore & Co.; N539 Ultra Spec 500 Interior Semi-Gloss.
b. PPG Paints: Speedhide Interior Semi-Gloss Latex 6-500.
c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex S/G B31 Series.

C. Steel Piping, Piping Supports and Hangers:

1. First Coat:

a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
b. PPG Paints: Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
c. Sherwin-Williams Company (The); Pro Industrial Pro-Cryl® Universal Primer; B66 Series at 1.9-3.8 mils DFT.

2. Second and Third Coats (Semi-Gloss):

a. Benjamin Moore & Co.; T546 Ultra Spec Interior Semi-Gloss.
b. PPG Paints: Speedhide Interior Latex Semi-Gloss 6-500.
c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Coating S/G (B66-W01151/B66-W01051).

D. Galvanized-Metal Substrates:

1. First Coat:

a. Benjamin Moore & Co.; Super Spec HP Acrylic Metal Primer HP04.
b. PPG Paints: Pitt-Tech Interior/Exterior Industrial DTM Primer/Finish Enamel 90-712.
c. Sherwin-Williams Company (The); Sherwin Williams Pro Industrial Pro Cryl Universal Primer B66-1310

2. Second and Third Coats:

a. Benjamin Moore & Co.; Ultra Spec HP DTM Acrylic Semi-Gloss HP29.
b. PPG Paints: Pitt-Tech Industrial DTM Acrylic Satin 90-474.
c. Sherwin-Williams Company (The); Pro Industrial DTM Acrylic Coating S/G (B6 6-W01151/B66-W01051).

E. Gypsum Board Substrates:

1. First Coat:

a. Benjamin Moore & Co.; Fresh Start High Hiding Primer 046.
b. PPG Paints: Speedhide Interior Latex Primer/Sealer 6-2
c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex Primer (B28W02600.)

2. Second and Third Coats (Eggshell):

a. Benjamin Moore & Co.; T538 Ultra Spec 500 Interior Eggshell.
b. PPG Paints: Speedhide Interior Latex Eggshell 6-411.
c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex Low Sheen (B20-Series.)

F. Insulation-Covering Substrates:

1. First Coat:

a. Benjamin Moore & Co.; Fresh Start High Hiding Primer 046.
b. PPG Paints: Speedhide Interior Latex Primer/Sealer 6-2.
c. Sherwin-Williams Company (The); PrepRite® ProBlock® Interior-Exterior Latex Primer-Sealer at 1.4 DFT

2. Second and Third Coats (Semi-Gloss):

a. Benjamin Moore & Co.; T546 Ultra Spec 500 Interior Semi-Gloss.
b. PPG Paints: Speedhide Zero Interior Semi-Gloss Latex 6-4510.
c. Sherwin-Williams Company (The); Pro Mar 200 Zero VOC Interior Latex Primer (B28W02600.)

END OF SECTION 09 91 00

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and all Division 01 Sections, apply to this Section and to all of Division 23.

1.2 SUMMARY

A. This Section includes the following:

1. Definitions, references, and abbreviations.
2. General regulatory requirements.
3. General requirements regarding site/field conditions including existing conditions and field measurements.
4. Sequencing and scheduling including coordination.
5. Definition of design equipment and procedures for consideration of specified equivalents, proposed equivalents, or substitutions.
6. HVAC demolition.
7. Equipment installation requirements common to equipment sections.
8. Minimum material requirements and equipment verification.
9. Electrical components for HVAC Work
10. Concrete bases and grout.
11. Mechanical penetrations, waterproofing, and sealants.
12. Fire-stopping
13. Access doors
14. Painting and finishing.
15. General requirements for demonstration of completed systems

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. "Design Equipment", "Design Make", "Basis of Design", and similar terms: Equipment, specified in Technical Specification Section or on Contract Drawings using applicable manufacturer's designation, that forms the basis for performance requirements, physical dimensions, configuration, electrical connection requirements, and similar aspects used in the design of this Project including (but not limited to) physical configuration of surrounding construction and location of connections to other components.

G. Specified Equivalents: Products identified in Technical Specification Section that may provide performance complying with specified requirements but may not have the same arrangement, configuration, size, construction, or other aspects as the specified Design Equipment. Refer to Section 00 21 13 - Instructions to Bidders, and Section 01 25 00 – Substitution Procedures for additional information and requirements regarding equivalents and substitutions.

H. "Equivalents", "Proposed Equivalents", "Proposed Products" and similar terms: These terms may be used interchangeably and mean the same thing: Products NOT identified in Technical Specification Section that the Contractor proposes in accordance with Section 00 21 13 - Instructions to Bidders and Section 01 25 00 – Substitution Procedures.

I. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor, all in accordance with Section 01 25 00 – Substitution Procedures.

J. Heating Work: Refers to Heating, Ventilating and Air Conditioning Systems and Equipment where used in technical specification sections of Division 23.

1.4 ABBREVIATIONS

A. Abbreviations: Reference to technical society, organization, body or section made in Division 23 in accordance with the following abbreviations:

1.	AIA	American Institute of Architects
2.	ADA	Americans with Disabilities Act.
3.	AMCA	Air Movement and Control Association International, Inc.
4.	ANSI	American National Standards Institute
5.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
6.	ASME	American Society of Mechanical Engineers International
7.	ASTM	American Society for Testing and Materials International
8.	AWS	American Welding Society
9.	IBC	International Building Code, New Jersey Edition
10.	IEEE	Institute of Electrical and Electronics Engineers, Inc.
11.	NEC	National Electric Code
12.	NEMA	National Electrical Manufacturers Association
13.	NFPA	National Fire Protection Association
14.	NYBFU	New York Board of Fire Underwriters
15.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
16.	UL	Underwriters Laboratories Inc.

1.5 SYSTEM DESCRIPTION

A. Provide complete systems, properly connected, tested, balanced, adjusted, and ready for operation, including all necessary and required controls, safeties, details and accessories, including (but not limited to):

1. Demolition and removals required for equipment and system installation, including all system fluid and solid components.
2. Piping systems and related equipment.
3. Refrigeration systems and related equipment.
4. Ventilation systems and related equipment.
5. Support Systems and related equipment.
6. Insulation Systems and related equipment.
7. Miscellaneous items required for equipment and system installation.
8. Controls and electrical control wiring to equipment furnished in this contract.
9. Electrical power wiring to equipment furnished in this contract, where not covered elsewhere.

B. HEATING WORK DRAWINGS ARE DIAGRAMMATIC. Do not infer that Drawings show level of detail indicating every offset, elbow, union, fitting, elevation or aspect ratio changes, or other details required for complete installation.

1. Provide all required fittings, offsets, elevation changes, dampers, controls, components, and similar items not indicated on Drawings, as required for a complete properly operational system.

1.6 SUBMITTALS

A. General Division 23 submittal requirements:

1. Procedural Requirements: Comply with requirements of Section 01 33 00 - Submittals and as modified below.

a. Specified Products: If product to be incorporated into Project is the basis of design equipment, and will be installed as specified in Part 3 in the product's technical specification section, and only where allowed as such in submittal portion of product specification, then the "As-Specified Verification Form" (attached to Section 01 33 00 - Submittals) may be used in lieu of "Product Data" identified.

b. Do not use "As Specified Verification Form" unless specifically indicated in detailed product specification.

c. Equivalent Products or Substitutions: If product proposed to be incorporated into Project is <u>not</u> the basis of design equipment, comply with all Product Data requirements specified.

2. Product Data: Submit Product Data for items listed in individual technical section. Clearly identify manufacturer, pertinent design, function, materials, construction, and performance data specifically addressing specification description and Contract Document requirements of item. Where more than one product is indicated on

manufacturer product literature, strike out products that are not applicable to item being submitted, highlight options selected and proposed, and remove extraneous pages of catalogs not being used in the project..

a. Cover Sheet: Attach cover sheet, identified in Section 01 33 00, to Product Data of each item submitted. Provide cover sheet for only one type of item with related accessories, equipment with related components. Do not combine unrelated items under same cover sheet.

b. Specified Equivalent Product Data: Submit manufacturer's product information including product literature, technical specifications and descriptions, performance data, and similar items to demonstrate compatibility with Basis-of-Design Equipment as specified in "Manufacturers" in Part 2 - Products below.

3. Coordination Drawings: Prepare Coordination Drawings in timely manner to comply with overall construction schedule. Refer to Sections 01 31 00 and 01 33 00 for more details.

a. Prepare drawings coordinating HVAC systems, lighting fixtures, ceiling mounted devices, ceiling heights, materials, structural work, maintenance clearances, electric code clearance, building systems, existing construction, etc. Provide additional details and sections, as required for clarity, at all places of potential conflict.

b. Deliver Coordination Drawings in accordance with requirements specified in Section 01 31 00. Indicate areas of conflicts between HVAC systems and other building components by highlighting locations on drawings and separately listing.

c. Reposition proposed locations of HVAC systems as required to work within project constraints. Adjust exact size, aspect ratio, location and offsets of ducts and pipes as required. Achieve as specified and other reasonable appearance objectives in open areas without ceilings without increase in Contract Sum.

d. Review of Coordination Drawings in accordance with Section 01 31 00 does not relieve Contractor from responsibility for coordinating HVAC systems with Project work, nor does it authorize extra cost, omission or deviation from Contract Document requirements. Costs arising from errors or omissions in Coordination Drawings shall be borne by Contractor.

e. Review Coordination Drawings and compare them with all other drawings to verify that all Work can be installed without interference. Notify Owner's Project Representative in case of unresolved interferences prior to installation of any work. Revise Coordination Drawings as required to eliminate installation interferences upon direction of Architect.

f. Do not proceed with installation of systems in each area until agreement is reached with all concerned on exact arrangements for each room or area, unless otherwise directed by Architect. If Contractor proceeds prior to resolving conflicts, Contractor shall modify installed Work as required to permit other systems to proceed with a coordinated installation.

4. Specified Equivalent Drawings: Submit detailed drawings of proposed Specified Equivalents, indicating proposed installation of equipment and showing maintenance clearances, required service removal space, and other pertinent revisions to arrangement and configuration shown in Contract Documents.

5. Closeout Information, for inclusion in Operations and Maintenance Manual:

a. Approved submittals.

1) If "As-Specified Verification Form" submittal is approved, also include product data as specified in technical section for all components used.

b. Include all information required in Section 01 78 23 – Operation and Maintenance Data.

c. Include all other closeout information required by the individual technical specification sections.

B. Shop Drawings: Include dimensioned plans, sections, and attachments to other work for concrete bases.

C. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

1. Power Train Accessories
2. Concrete Bases, Grout
3. Sealants
4. Fire-stopping.
5. Access doors.
6. Painting and finishing.

D. Closeout Information, for inclusion in Operations and Maintenance Manual:

1. Approved submittals.

a. If "As-Specified Verification Form" submittal is approved, also include product data for all components used.

2. Include all information required in Section 01 78 23 – Operation and Maintenance Data.

3. Letters on manufacturer's letterhead from equipment manufacturers certifying that their equipment and systems have been installed in strict accordance with manufacturer's recommendations, properly aligned and adjusted, tested, lubricated, wired, balanced, etc.

4. Valve, and Lubrication charts as described below.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements

1. Comply with applicable requirements of all Federal, New York State, and Local Building, Health, Mechanical, Plumbing and Electrical Codes, Laws, Ordinances and Regulations, including (but not limited to):

   a. Building Code of New York State
   b. Mechanical Code of New York State
   c. Fire Code of New York State
   d. Energy Conservation Construction Code of New York State
   e. New York State Education Department Manual of Planning Standards
   f. In event of a conflict between the Codes identified above and Contract Documents, comply with more stringent requirement.

2. Comply with applicable requirements of NFPA, utility company regulations, and following standards:

   a. Provide Underwriters Laboratories (UL) labels on all electrical materials carrying 50 volts or more.

   b. Provide refrigeration equipment complying with Safety Code for Mechanical Refrigeration (ASHRAE Standard 15 - and ANSI Refrigeration Safety Code B9.1).

   c. Provide all boilers/burners in accordance with applicable requirements of New York State Labor Department Industrial Code Rule No. 4 (cited as 12 NYCRR4) and Code Rule No. 14 (cited as 12 NYCRR14).

   d. Provide all boilers/burners in accordance with applicable requirements of the State of Massachusetts General Laws chapter 146 (also known as MGR 146 section 46-51), and the Code of Massachusetts Regulations 522 (also known as 522 CMR 1-17).

B. Certifications: Obtain and pay for all necessary inspections and certificates from all applicable agencies. Perform all required tests in accordance with regulation of agency having jurisdiction. Submit certificates of approval prior to Final Completion as defined in Section 01 77 00 – Closeout Procedures. Submit certificates of approval prior to request for final acceptance of Contract.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner. Equipment must continue to comply with the requirements of the Energy Conservation Code applicable to the project.

D. Welding Quality Control for General Construction and Support Work:

1. This paragraph refers to qualifications for General Construction and Support Work welding only. Qualify welders, brazers, and any welding or brazing procedure to be used

on piping for this Project in accordance with ASME "Boiler and Pressure Vessel Code", Section IX, as specified and detailed in Section 23 21 13 - Hydronic Piping.

2. Welding and Brazing Procedure Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel." Qualification may by made by technically competent group or agency (subject to approval) meeting the following conditions:

    a. Group or agency qualifying the procedure meets all procedure qualification requirements of AWS D1.1/D1.1M, "Structural Welding Code - Steel.".

    b. Contractor accepts full responsibility for procedure qualified.

    c. Contractor has qualified at least one welder or welding operator using procedure qualified and provides record of qualification.

    d. Contractor accepts full responsibility for qualified procedures by signing related qualification records with procedure and performance qualifications including all dates, results, and associated data.

3. Welders' and Brazers' Qualifications: Ensure that all welders, welding operators, brazers, or brazing operators employed for this project are qualified for all welding and brazing procedures, proposed as part of this Project, in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel.". Qualification by previous employer or technically competent group or agency (subject to approval) may be acceptable if following information is included:

    a. Documentation that the previous qualification was for essentially the same procedures proposed and was in full accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel.".

    b. Copy of performance qualification testing record showing who qualified the worker, date of qualification, and work history record showing continuous performance to maintain qualification.

4. Weld and Braze Qualification Records: Maintain and sign certified records of approved procedures used and approved qualified workers employed for welded and brazed joints performed as a part of Prime Contract. Ensure all welding and brazing work can be traced to a specific procedure and welder.

5. Inspection and Examination by Owner, Remedy by Contractor: Owner reserves right to examine, inspect, and test all piping using visual, radiographic, or other recognized testing methods to determine compliance with specified quality control requirements and requirements of applicable regulatory agencies.

    a. Cost of Owner's testing of acceptable installation provided at Owner's expense.
    b. Repair piping installations not passing Owner's quality inspection testing using approved method or replace at no additional cost.
    c. Cost of initial testing of piping not conforming to specified requirements and any retesting of repairs or replacement work shall be deducted from Contract Sum.

E. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Ship materials in manufacturer's containers, fully identified with manufacture's name, trade name, type, class, style, model, grade, size and color.

B. Storage and Protection

1. Store materials, equipment, fixtures, pipe, fittings, attachments, under cover, off ground in original containers as applicable, and protect from physical and weather damage while in storage and during construction.

2. Furnish extra materials identified in technical sections, in original manufacturer's containers and packaging, to Owner at location identified during Preconstruction Conference. Obtain receipt from Owner upon delivery of extra materials and send copy of receipt to Architect.

3. Replace or repair damaged, rusted, corroded or otherwise unusable materials physically damaged or weather damaged equipment as determined by Architect, at no change in Contract Sum.

1.9 PROJECT/SITE CONDITIONS

A. Field Measurements

1. DO NOT SCALE DRAWINGS: Refer to Architectural and Structural drawings for dimensions and details, and verify measurements in field before proceeding.

2. Install all items with proper provision for removal and access to coil bundles, boiler components, valves, and similar components.

3. Layout of equipment, piping, and similar components in Drawings is diagrammatic. Review Drawings in the field, identify interference with other construction and verify dimensions at Site prior to beginning installation.

a. Obtain exact size and location of all items and openings and confirm all existing conditions in field. Review Shop Drawings of all Contracts.

b. Coordinate all Heating Work that interferes with other construction with other responsible Contractor.

c. Obtain exact location and roughing requirements for all equipment furnished by others, but installed by this Contractor before roughing. Owner reserves right to make reasonable changes prior to "roughing-in" without increase in Contract Sum.

4. Report any conflicts to Architect in writing before beginning installation.

1.10 SEQUENCING AND SCHEDULING

A. Perform all Heating Work in cooperation with Owner, Architect, Construction Manager, and all Contractors on this Project, and other separate Contractors at the Site.

1. Coordinate all Heating Work with construction schedule requirements in Division 01
2. Coordinate all submittals with the construction schedule and with requirements and schedules contained in Section 01 33 00 – Submittals Procedures.
3. Immediately report any delays in receipt of materials required for Heating Work including circumstances causing delays.

B. Existing Construction: Provide openings, chases, recesses, lintels and bucks required for admission of Heating Work, unless otherwise noted. Do not cut waterproofed floors or walls for admission of equipment or materials without written permission. Do not pierce structural members without written permission.

C. Supports for Heating Work: Provide anchor bolts required supporting or securing Heating Work. Locate settings and check locations as construction progresses. Provide templates or holding fixtures as required to maintain proper accuracy.

D. Cutting and Patching: Bear expense of cutting, patching, repairing or replacing of work of all Contracts required due to fault, error or damage by contractor responsible for Heating Work, unless otherwise specified in Contract Documents. Employ and pay Prime Contractor involved, or if there is no associated Prime Contractor, employ and pay qualified subcontractor as required for corrective work.

E. Refer to Division 01 for cooperation between Contractors. Prior to start of construction:

1. Obtain from Contract Drawings or Architect, exact location of items and openings in construction. Conform to existing conditions in field.

2. Review Shop Drawings of all Contracts.

3. If conflict occurs between Contract Drawings, advise Architect in writing before beginning installation and comply with Architect's directions.

4. Obtain exact location and roughing requirements for equipment furnished by other Contractor or by Owner, but installed by Contractor responsible for Heating Work before beginning roughing.

1.11 COORDINATION

A. Pre-Installation Conference:

1. Attend pre-installation conference. Arrange for all subcontractors to be in attendance.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

C. Coordinate Heating Work with existing plumbing systems, lighting fixtures, ceiling mounted devices, ceiling heights, materials, structural work, maintenance clearances, electric code

clearance, and building systems. Verify that Work of all Contractors can be installed without interference with Heating Work.

D. Notify Architect in case of unresolved interferences prior to installation of Heating Work.

E. Adjust exact size, location and offsets of exposed HVAC components to achieve reasonable appearance objectives without increase in Contract Sum.

F. Testing and Balancing: Cooperate with contractor responsible for Testing and Balancing work as required ensuring complete and proper testing, balancing and adjustment of air and water systems. Refer to Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC, for details.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Equipment – Provide as specified and scheduled with all options as required for full compliance.

B. Specified Equivalents - If Specified Equivalents (refer to "Definitions" in Part 1 above) are proposed, comply with following requirements:

1. Submit "Specified Equivalent Drawings" as specified in "Submittals" in Part 1 above.

    a. Provide required changes in design and adjacent construction or equipment at no increase in Contract Sum.

        1) Where required, provide larger motors, equipment, additional control devices, valves, fittings, and other miscellaneous equipment necessary for proper operation and provide proper location of roughing and connections to other Contractors.

        2) Provide additional motors, starters, power, wiring, and control wiring required.

        3) Provide revisions to equipment, wiring, support structure, controls, valves, fittings, and other miscellaneous equipment.

        4) Additional Architectural and Engineering work, coordination, and documentation.

    b. If proposed arrangement for Specified Equivalent is rejected, revise to be compliant and resubmit or submit Basis-of-Design Equipment.

2. Submit "Specified Equivalent Product Data" as specified in "Submittals" in Part 1 above to demonstrate that proposed Specified Equivalent is equal to or better than Basis-of-Design Equipment with respect to all performance characteristics, including but not limited to durability, individual equipment operating costs, entire interrelated system operating costs, service access, noise levels, vibration levels, compatibility with Owner's

other existing equipment to minimize parts inventory, aesthetics where applicable, and similar characteristics.

3. Do not assume that approval of a specified equivalent submittal implies approval of the installed product. Correct all deviations uncovered during construction and warrantee period that result in or are caused by any lower performance characteristic than the specified Basis of Design equipment.

C. Proposed Equivalents and Substitutions: In addition to requirements described elsewhere in these Contract Documents, all proposed equivalent and substitution products being considered shall be subject to the Specified Equivalent requirements listed above.

2.2 MATERIALS

A. Minimum Material Requirements:

1. Provide electrical equipment and systems meeting UL standards and requirements of NEC.

2. Provide UL label on all equipment and material with listing service.

3. Material Flammability:

a. Flame spread rating of 25 or less.
b. Smoke developed rating of 50 or less.

4. Equipment Verification: Carefully check manufacturer's drawings and specifications as they affect their particular equipment; follow factory instructions for roughing, installation, connection, filling, lubrication, testing, balancing, adjusting, alignment, wiring, and start-up operation.

2.3 MOTOR POWER TRAIN ACCESSORIES

A. For all new motor installations provide accessories listed below as required for a complete new drive system.

B. Independently Mounted Direct Driven Load Motor Couplings: Interlocking machined and balanced steel spider locked Molded rubber insert and capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. Include EPDM coupling sleeve for variable-speed applications.

C. Provide personnel guards to fit new motor and drive for all new equipment motors, whenever replacement motor and drive do not fit existing guard, or where noted to provide new guard on drawings.

1. Personnel guards shall be of OSHA approved construction surrounding belts, shafts, and pulleys, with tachometer holes for motor and driven shafts.

2.4 CONCRETE BASES AND SUPPORTS

A. Use 4000-psi f_c air entrained concrete, maximum #1 aggregate, all edges chamfered 1-1/2 inches, trowel finished, and properly consolidated to eliminate voids. Reinforce and secure to floor with #4 rebar dowels 18 inches O.C. 3 to 6 inches from edge around entire perimeter, inserted into structural slab 3 inches minimum and extending to within 1 inch of pad top. Enclose dowels with #4 deformed rebar ring around all dowels overlapped 18 inches minimum and bent in at ends 12 inches minimum, secured to dowels at center of pad height. Roughen structural slab, and coat with cement grout before pour. Ensure all equipment bolt down locations are within reinforcement ring, extended into structural slab as required by seismic considerations.

B. Set adjustable internal threaded concrete inserts at appropriate bolt-down locations before pouring equipment bases. Use expansion anchors extended into structural slab as required by seismic considerations. If reusing existing concrete base, use expansion anchors. After leveling and anchoring equipment, fill equipment bases with grout as required.

C. All Other Equipment Bases: 3-1/2 inches thick minimum, reinforced with 6x6-W1.4xW1.4 welded wire mesh, minimum 1-1/2 inches cover, doubled over 12 inches on long edges, unless otherwise specified

2.5 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink, non-metallic, high strength grout, suitable for interior and exterior, above and below grade applications.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.6 SEALANTS

A. Comply with requirements for sealants in non-fire rated penetrations specified in Section 07 92 00 "Joint Sealants", and also with requirements for Air duct sealants in Section 23 31 00 – Ductwork.

B. Provide premium products specified for each application as appropriate.

2.7 PENETRATION FIRESTOPPING

A. Comply with requirements for sealants in fire rated penetrations specified in Section 07 84 13 - Penetration Firestopping.

B. Submit Manufacturers Product Data Sheets for each type of product selected. Certify that Firestop Material is free of asbestos and lead paint, and complies with local regulations.

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Submit system design listings, including illustrations from qualified testing and inspection agency that is applicable to each firestop configuration.

D. Submit a project specific Penetration Firestopping Schedule indicating where each firestop configuration will be used.

2.8 PAINT AND FINISHES

A. Refer to Division 09 for paint and finish product specifications.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS

A. Examine existing conditions in the field prior to beginning demolition or contract Work as required to confirm conditions are appropriate for the work to proceed. Refer to Section 01 73 00 "Execution" and Section 02 41 19 "Selective Demolition" for additional information and general demolition requirements and procedures.

B. Reuse materials and equipment only as indicated on Drawings. Furnish new equipment and materials in conformance with Contract Documents for all Heating Work, including any material, operation, method or device mentioned, listed or noted within Division 23 Sections, unless reuse is specifically indicated, or unless specified as furnished or installed by Owner, all Contractors, or others.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is otherwise made unserviceable by adjacent or associated work or error, remove damaged or unserviceable portions and replace with new products of equal capacity and quality. Verify, document, and confirm pre-existing damage with Owner and Architect before beginning work.

3.2 HVAC DEMOLITION

A. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.

1. Prior to removal of system components, provide for proper working conditions including but not limited to:

a. Electrically shutdown and/or disconnect with lockout / tag as required.
b. Provide Personnel Protection Equipment.
c. Air Systems: seal off portions of systems not under construction as required protecting Owner’s belongings.
d. Hydronic Systems: Properly isolate and drain systems as required protecting Owner’s belongings.

e. Refrigerant Based Systems: Evacuate and retain refrigerant per ASHRAE 15 and 40 CFR 82.

2. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material at point of continued use or as otherwise specifically indicated.

3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and cap remaining ducts with same or compatible ductwork material.

4. Equipment to Be Removed: Disconnect and remove equipment and all associated accessories. Plug, cap, seal, and otherwise patch to match as required.

5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

B. Disposition of Removed Components:

1. All material and equipment shown on the drawings to be removed during project Work that is not indicated on the drawings as being either reused or turned over to the Owner becomes the Contractor's property as a part of the project including salvage value and legal disposal cost complete.

2. For components that become the Contractor's property through this removal process: Confirm transfer of ownership in writing then promptly remove from the site and legally process.

3. For components indicated on the drawings to be turned over to the Owner: deliver to a project site location designated by the Owner.

4. For components indicated on the drawings to be reused: carefully remove, protect, and store until appropriate time for re-installation. Document any pre-existing damage prior to removals.

5. For pipe and tubing indicated to be reused, reuse only those portions of pipe, tubing, and associated fitting assemblies where they are direct replacements of the as specified and as shown new piping assemblies. Valves, strainers, other piping specialties, and insulation shall not be re-used unless specifically indicated on drawings.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

E. Ensure each equipment manufacturer:

1. Carefully checks Contract Drawings and Specifications applicable to manufacturer's equipment before roughing.

2. Reports to Architect, before or when Shop Drawings are submitted, any discrepancies or conditions applied to manufacturer's equipment that prevents proper functioning, servicing, and other aspects of equipment operation.

3. Provides manufacturer's printed installation instructions for each piece of equipment.

4. Thoroughly instructs Contractor exactly how equipment should be installed, connected, lubricated, started, operated, and similar aspects to ensure all factory instructions are rigidly followed during installation of equipment.

F. Install, test, start, and operate equipment as instructed by manufacturer.

G. Submit written evidence from equipment manufacturer that manufacturer's equipment and systems have been:

1. Installed in strict accordance with manufacturer's recommendations.
2. Properly aligned and adjusted, tested, lubricated, wired, balanced, and similar operations

H. Equipment Connections

1. Provide final make up water, chilled water, heating water, drain, vent, refrigerant, and gas connections to all equipment as required.

2. Provide isolation valves and flanges or unions on the supply and return piping connections to all equipment arranged as required for reasonable service isolation and access.

3. Provide equipment waste, drip, overflow, bleed water, condensate, and drain connections extended to floor or roof drains or other approved points of discharge.

4. Connect equipment complete and ready-to-use, including all valves, piping, piping accessories, devices, gauges, relief valves, vents, drains, insulation, sheet metal work, controls, dampers, and similar components required.

I. Precautions Against Freezing: In addition to applicable requirements in Division 01 and individual technical sections, take all necessary precautions with equipment and systems to prevent damage to building, piping, equipment, and other components due to freezing and water leakage until final acceptance. Before freezing weather occurs, make certain all:

1. Safety features are properly functioning.
2. Freeze protection is tested and sensing elements are properly located.
3. Outside air dampers are tight fitting and operational, and damper motors are properly winterized.
4. Air systems are properly balanced.

5. Proper insulation is installed where required.

J. Concealment: Conceal all Work not specifically shown on the Drawings as exposed. Note piping risers may be shown outside of walls due to scale of drawing symbols – the general intent is for these pipes to be concealed within the general construction if possible or if not possible, to be within riser chases. If for any reason concealment is impossible, notify the Architect and obtain written approval before starting that part of the Work.

K. Exposed Items: Install exposed items as shown on Drawings or as approved by Architect. Obtain Architect's approval for final arrangement and appearance before installing items in areas without ceilings.

L. Damaged Components and Replacement: If pipe, duct, insulation, or any HVAC component or equipment is damaged in appearance or is otherwise unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.4 ERECTION OF SUPPORTS AND ANCHORAGES

A. Provide a complete system of support and anchorage for all Contract work.

B. Refer to Section 23 05 29 - Hangers and Supports for HVAC Components, Section 23 05 43 – Mechanical Vibration and Movement Control, and Division 05 and Division 06 complete for detailed additional requirements.

3.5 CONCRETE BASES

A. Provide concrete bases for all floor-mounted HVAC systems equipment, unless specifically indicated otherwise in Contract Documents.

1. Shape and size to accommodate equipment, with minimum of 6 inches clear pad all around perimeter unless otherwise required by equipment manufacturer.

2. Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic requirements of Project. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with anchorage.

3.6 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
B. Clean surfaces that will come into contact with grout.
C. Provide forms as required for placement of grout.
D. Avoid air entrapment during placement of grout.
E. Place grout, completely filling equipment bases.
F. Place grout on concrete bases and provide smooth bearing surface for equipment.
G. Place grout around anchors.
H. Cure placed grout.

3.7 MECHANICAL PENETRATIONS, WATERPROOFING, AND SEALING

A. Opening Through Outside Walls:

1. Guarantee all penetrations to be thoroughly air and watertight. Caulk and flash penetrations in accordance with specifications, details on Drawings, and as required.

2. Use special waterproof construction as directed.

3. Provide mechanical sleeve seals for piping penetrations.

B. Openings Inside Walls: Provide through penetration systems for all mechanical work floor and wall penetrations which do not compromise the integrity of the floor or wall with regards to fire rating, smoke passage rating, acoustical noise reduction rating, or seismic rating. Insure through penetration system does not transmit mechanical vibrations to building walls or floors. Seal all floor penetrations to effectively block the passage of smoke and fumes.

1. Provide structural support for floor deck around all penetrations larger than 12 inches in any dimension, unless specifically indicated otherwise elsewhere on the contract documents.

3.8 FIRESTOPPING

A. Provide Through-Penetration Firestopping Systems and Devices listed in UL Fire Resistance Directory under categories XHCR and XHEZ and conforming to construction type, penetrant type, annular space requirements and fire rating indicated or required for each application.

B. Provide systems that withstand passage of cold smoke either as inherent property of system or by use of separate product included as part of UL system or device designed to perform this function.

3.9 PAINTING

A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

B. Vary initial and final coat colors slightly as required to provide positive identification between coats. Do not proceed with final coat until initial coat is properly cured per manufacturer's instructions, and has been approved as complete by Owner's Project Representative. Final coat shall completely conceal initial coat(s).

C. Paint Requirements:

1. Provide painted finish for HVAC components (exposed gas piping). Provide factory painted finishes as specified elsewhere or if not factory painted then field painted. Refer to Division 09 for painting specifications and additional painting requirements if required.

a. Provide touch up painting as required to repair, or replace as directed, damaged factory finishes of HVAC components.

2. Paint all exposed metal surfaces that will be above 150 degrees F when in operation, with two coats of heat resistant paint.

3. Paint all miscellaneous fabricated ferrous supports complete.

4. For piping that will be subject to moisture induced corrosion on the exterior of the piping, provide one full coverage coat of corrosion inhibiter equal to "Polyguard RG-2400" on the following ferrous (steel) piping and fittings before insulation is applied:

   a. All exterior ferrous piping.
   b. All ferrous piping where the fluid in the piping operates at below ambient conditions (all cooling piping)

5. Do not paint

   a. Chrome plated materials, aluminum and brass valves, or brass trim on iron body valves, stainless steel materials, copper indirect waste piping, laboratory waste and vent piping.

   b. Piping above finished ceiling spaces, except un-insulated ferrous piping and supports.

   c. Exposed copper pipe, brass valves, or brass trim on iron body valves, or machinery or equipment with factory-applied finish, unless otherwise specified.

6. Coating Systems: Comply with application and material requirements specified in Division 09.

7. Color Code Identification: Provide color code identification of mechanical piping in Boiler Rooms, Mechanical Rooms and Fan Rooms by painting the following services as listed below.

	Item	Color
a.	Fuel Gas Piping	OSHA Safety Yellow
b.	Heating hot water supply	Dark Red
c.	Heating water return	Light Red
d.	Chilled water supply	Blue
e.	Chilled Water return	Light Blue
f.	Cold water (makeup)	White (ASJ without paint OK)
g.	Chemical treatment	White (ASJ without paint OK)

3.10 PROTECTION

A. Maintain systems during construction, temporary use, and until acceptance by Owner.

1. Properly lubricate all HVAC systems bearings during use.
2. Maintain limit controls, overload devices, and safety controls in operating condition during use

3.11 ALTERATIONS

A. Provide protection of existing facilities, demolition and removals, replacement and restoration, including patch-to-match requirements, and hazardous materials procedures to install Heating Work in conformance with Division 01 requirements.

B. Provide cutting and patching required to install Heating Work in accordance with the requirements of Division 01 covering cutting and patching.

3.12 ADJUSTING AND CLEANING

A. Adjust all work as required to insure systems perform as designed and as intended, including but not limited to the following:

1. Adjust all hangers and supports to insure proper piping slope, alignment of flexible connections, even loadings, proper venting and draining, proper control over thermal expansion, etc.

2. Adjust all mechanical equipment insuring it runs properly as intended, providing the performance specified and required, and as required to maintain all warrantees.

B. Clean work furnished or provided as part of Heating Work, including but not limited to equipment, control panels and devices.

1. Refer to and comply with Section 01 50 00 - Temporary Facilities and Controls for additional requirements for cleaning during construction and Section 01 77 00 – Closeout Procedures for additional requirements for final cleaning.

2. Remove debris, leftover piping, tubing, metal, insulation, cartons, papers, etc., resulting from Heating Work.

3. Remove all rust, dirt, oil, etc. from Heating Work to be painted and maintain in condition ready for painting.

4. Clean inside and outside of all equipment and distribution systems provided including (but not limited to) following:

a. All enclosures.

b. Remove all rust, oils, and similar contamination from all equipment, piping and supports to be painted, and leave components ready for painting.

c. Remove debris, leftover piping, wiring, tubing, metal, insulation, cartons, papers, and similar items left in building or on Site. Clean building as often as necessary and when directed by Architect.

C. Final Cleaning: In addition to requirements specified in Section 01 77 00 – Closeout Procedures and other sections in Division 23, provide following measures.
1. Clean all piping strainers and replace all "startup" screens with permanent screens.
2. Provide written notification to Architect upon completion of all final cleaning procedures and request inspection of final cleaning.

3.13 DEMONSTRATION OF COMPLETED SYSTEMS:

A. Prior to Final Completion, thoroughly demonstrate and instruct Owner's designated representatives in care and operation of all heating and ventilating systems and equipment provided in Heating Work. Provide necessary skilled labor to operate all systems for not less than 5 days and provide required instruction.

1. In addition to Contractor's instruction, arrange for technically qualified factory representatives to train Owner's designated representatives in care, maintenance, and operation of following manufacturer's equipment and systems.

a. Temperature controls.
b. Boilers / Burners.
c. Chiller
d. Variable speed drives.

2. Coordinate and schedule time and place of all training through Architect at Owner's convenience.

3. Submit letters verifying satisfactory completion of all instruction including date of instruction, names of persons in attendance and countersigned by authorized representative of Owner.

4. Until final acceptance, Contractor retains full responsibility for systems operations and maintenance, even though operated by Owner's personnel during instruction, unless otherwise agreed to in writing.

5. During instruction, provide list, sealed in clear plastic, outlining operating, maintenance, and starting precautions and procedures to be followed by Owner for operating systems and equipment.

B. Valve Identification Chart: Provide a valve chart for all valves installed in contract.

1. Provide 8-1/2 inch x 11 inch minimum size Valve Identification Chart, typed in capital letters, mounted under clear laminated plastic; secure to wall where directed.

2. Valve Numbering System: Extension of and compatible with existing valve numbering system, where valves are installed in existing building or in addition to existing building. Do not duplicate existing numbers; verify existing numbers in the field.

3. List all valves included in Contract. Obtain necessary information containing the following:

a. Valve number, piping system, system abbreviation (as shown on valve tag) and location of valve.
b. Normal operating position (open, closed, or modulating).
c. Clearly identify special purpose valves (for emergency shutoff, etc.).

C. Lubrication Chart: Provide minimum 8-1/2 inch x 11 inch lubrication chart for all Work in Heating Work Contract, typed in capital letters, mounted under clear laminated plastic, and secured to wall where directed by Architect.

1. List all motors and equipment including following information:

    a. Name and location of equipment.
    b. Type of lubrication recommended by manufacturer.
    c. Lubrication period recommended by manufacturer.

2. Lubricate all motors immediately after installation and perform lubrication maintenance until final acceptance by Owner.

END OF SECTION 23 05 00

SECTION 23 05 13 - COMMON ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. General requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

2. Starters and drive train accessories for electric motors.

    a. Refer also to Section 23 29 00 for Variable Frequency Motor Controllers.

3. Electrical auxiliary components required for HVAC systems that are not specifically identified in “E” series Drawings or Division 26.

4. Electrical wiring required for HVAC systems that is not specifically identified in “E” series Drawings or Division 26.

1.3 SUBMITTALS

A. General: Submit all action submittals required by this Section concurrently.

B. Action Submittals:

1. Product Data: For each type of product indicated, demonstrating compliance with all specified performance and construction characteristics.

C. Informational Submittals:

1. Motor Efficiency and Rebate Data: Submit copies of forms from applicable utility agencies regarding availability of energy efficiency rebates with minimum motor efficiency requirements, along with tabulated efficiency ratings of all motors provided as a part of this contract work which are of a size applicable to the rebates, demonstrating compliance with project efficiency requirements.

D. Closeout Submittals:

1. Installation, Operation, and Maintenance Data: For motors, drives, electrical power components, and heat trace - include in operation and maintenance manuals.
    a. Wiring Diagrams: Employ competent technical aid to prepare composite wiring diagrams for field wiring of power, signal, and control wiring for all equipment and systems installed as part of the HVAC Work. Deliver diagrams to proper parties in time for roughing of conduit and equipment connections. Clearly indicate all items to be mounted or wired as part of DIVISION 26. Include as built wiring diagrams in O&M manual.

1.4 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Manufacturers: Provide products by one of following manufacturers or equal, except where unusual configurations involving frame, hermetic seals, shaft, bearing, or starting characteristics are peculiar to particular item of equipment as specified by Architect:

1. National Resource Management (NRM).
2. Baldor.
3. General Electric.
4. U. S. Motors.

B. Provide all motors required for the work of Division 23 specifications. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or individual technical specification sections.Remove paragraph below if applicable

1. Provide all motors suitable for operation at the frequency, voltage, and phasing of the building power.

C. Provide motors 1/2 HP and larger and motors indicated as driven by variable speed drives, designed for operation on 3-phase power, voltage as shown on electrical plans, +/- 10 percent, unless specifically indicated otherwise on drawings.

D. Provide constant speed motors 1/3 HP and smaller designed for operation on single phase, 120 volts +/- 10 percent.

E. Comply with NEMA MG 1 unless otherwise indicated.

F. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS AND APPLICATIONS

A. Provide each motor suitable for continuous duty operation at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level, and suitable for speed, enclosure, rating, type and horsepower not less than as scheduled or specified in Contract Documents. Provide motor enclosure and maximum allowable temperature rise in degrees Centigrade over 40 deg. C ambient as follows, unless otherwise specified:

1. General Purpose: Drip-proof 40 deg. C or encapsulated design 60 deg. C.

2. Below grade level, roof-top unit, damp, high humidity, or condensing applications: Totally enclosed fan-cooled 50 deg. C or drip-proof encapsulated design 60 deg. C.

3. Motors, wiring, and disconnects installed in potentially flammable atmosphere: UL listed, NEC rated explosion proof construction, fan-cooled 50 deg. C rise.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

C. Each equipment manufacturer is responsible for ensuring motors supplied with manufacturer's equipment are fully compatible with the application and capable of starting and running driven equipment without undue noise, heating, or distress.

2.3 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.
5. Electronically Commutated Motor (ECM)

B. Motors 1/20 HP and Smaller: Shaded-pole type.

C. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

D. Variable Speed Motors: Electronically commutated motor (ECM) shall be of permanent magnet, brushless DC premium efficiency design with variable speed electronic controller capable of maintaining constant speed, torque, and/or cfm as required by service, capable of accepting 0-10vdc or 4-20mA speed control signal from building management system. Adjustable slow start and gradual speed changes, permanently lubricated ball bearings, and extra quiet operation are all included.

E. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

F. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.4 POLYPHASE MOTORS

A. Single Speed General Application Motors:

1. NEMA MG 1, Design B, medium induction motor.
2. Efficiency: Premium efficiency, as defined in NEMA MG 1.
3. Service Factor: 1.15.
4. Random-wound, squirrel cage rotor.
5. Re-greasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
6. Insulation: Class F.
7. Temperature Rise: One class below insulation rating.
8. Motors 15 HP and Larger: NEMA starting Code F or Code G.
9. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
10. Enclosure Material: Manufacturer's standard rolled steel or cast iron enclosures corresponding to NEMA rating and application requirements.

B. Multi-Speed General Application Motors:

1. Similar to single speed motor requirements above, with separate winding for each speed.

2. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

C. Motors Used with Variable Frequency Controllers:

1. Motors shall meet all other requirements of this document, the driven equipment manufacturer, and the Variable Frequency Controller manufacturer, and be rated for this service with the drive and voltage intended. Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

2. All three phase motors for use with variable frequency controllers shall be special application, inverter duty premium efficiency motors of cast iron construction.

3. Ratings shall be in accordance with NEMA MG-1, Part 31 requirements for the specific application.

4. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.

5. Class B temperature rise; Class F insulation.

6. Thermal protection via one Class F thermostat per phase, NEMA MG 1 compliant with requirements for thermally protected motors.

D. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 MOTOR ACCESSORIES

A. For all new motor installations, whether in new equipment or installed as replacement motors, provide accessories listed below as required for a complete new drive system.

B. Provide personnel guards to fit new motor and drive for all new equipment motors, whenever replacement motor and drive do not fit existing guard, or where noted to provide new guard on drawings.

1. Personnel guards shall be of OSHA approved construction surrounding belts, shafts, and pulleys, with tachometer holes for motor and driven shafts.

C. Direct connected motors: provide with flexible couplings if required by application and OSHA approved belt guards surrounding rotating machinery.

2.6 STARTERS

A. Manufacturers: Provide all starting equipment and control devices manufactured by same manufacturer and furnished through single responsible supplier unless otherwise specified in Contract Documents. Factory-wired or assembled packaged equipment may be provided with starting equipment of any acceptable manufacturer. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cutler-Hammer
2. General Electric
3. Square D

B. Provide starters, contactors, and controllers complying with applicable NEMA standards, minimum size 0, and enclosed in enclosures of type appropriate for environment where installed including general purpose, explosion proof, weather resistant, or weather-tight construction as required.

C. Ensure all parts subject to wear, arcing, and similar use are easily removable.

1. Provide necessary auxiliary contacts for each starter subject to electrical interlock or automatic control.

2. Equip magnetic starters for motors operating 208 volts and over, line-to-line, equipped with self-contained light loads imposed thereon with a control transformer having a 120-volt grounded secondary winding, and having 120-volt starter operating coils.

D. Provide combination-type magnetic starters with fused disconnect switches. Fuse with class R fuses. Protect all starters with manual reset, solid state overload relay equal to (Square “D” motor logic) in one leg of single phase line to neutral circuits, in two legs of single phase line-to-line circuits, and in three legs of 3-phase circuits.

E. Provide 6-volt, red pilot light, integral transformer and long life bulb for all starters and contactors.

F. Manual Starters: Toggle operated, single pole for line to neutral circuits, two pole for line-to-line circuits, with thermal overload devices and neon pilot light; flush mounted unless shown otherwise, ganged with selector switch for multispeed applications. Provide manual starters similar to one of the following:

1. General Electric CR-101
2. Cutler-Hammer 9101
3. Square D Class 2510

G. Combination Magnetic Starters: Single speed, across the line, HAND-OFF-AUTO selector switch in cover. Provide combination magnetic starters similar to one of the following:

1. Cutler-Hammer 9589
2. General Electric CR-107
3. Square D Class 8538

H. Magnetic Contactors: With control coil in series with temperature controls as required.

I. Refer to Section 23 29 00 – VARIABLE FREQUENCY MOTOR CONTROLLERS for requirements of these devices.

2.7 ELECTRICAL HEAT TRACE

A. Provide heat trace cable for all piping, valves, and fittings installed outdoors or otherwise exposed to freezing temperature, and as shown on drawings.

B. Constructed of nickel plated 16 gauge bus wires connected by semi-conductive heat sensitive heating matrix, with flouropolymer dielectric insulation and nickel plated copper braid protective jacket. Cable to be rated for continuous exposure to steam temperatures, providing minimum 6W/ft at 50 deg F, output to decrease with increasing temperatures in self-limiting fashion.

C. Include all required and recommended accessories including but not limited to electrical fittings, thermal transfer mastic, controls, warning tape, etc.

D. Provide separate thermostat and controls for each separate service, thermostat range designed for freeze protection. Provide field wiring of heat trace cable through factory supplied connectors and controls to power source.

E. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Thermon type TSX
2. Chromalox type SRM/E
3. Nelson or equal.

2.8 COMPONENTS

A. Electrical Wiring: Provide all materials conforming to NEMA Standards and UL approved for intended service. Refer to appropriate sections in Division 26.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which materials and methods are to be installed and notify Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in acceptable manner.

1. Installation indicates conditions are acceptable to Contractor as required to ensure requirements for applicable warranty or guarantee can be satisfied.

2. Motors and Starters: Confirm electrical characteristics for all equipment.

3. Electrical Wiring: Check all electrical wiring associated with equipment for compliance with specifications and correctness of connections. Correct wiring in event equipment or devices fail to function in specified manner, whether due to incorrect connections or improper information and wiring diagrams.

B. Inspect and perform tests on project electrical wiring, including infrared scans (thermography), resistance testing, or other industry standard testing as required to demonstrate acceptable wiring. Owner reserves the right to provide their own additional similar testing:

1. Cost of Contractor's testing included in bid price. Cost of Owner's testing of acceptable installations provided at Owner's expense.

2. Repair installations not passing Contractor's or Owner's quality inspection testing using approved method or replace at no additional cost.

3. Cost of initial testing of wiring not conforming to specified requirements and any retesting of repairs or replacement work deducted from Contract Sum.

3.2 INSTALLATION

A. Motors and Starters

1. Correct, at no additional cost, any misapplied motor or starter combination and improper thermal overload devices for motor starters provided as part of HVAC systems or components, along with damage to other equipment or construction.

2. Motors: Provide motors furnished by equipment manufacturer, specifically manufactured or selected for equipment served; mounted, and installed to provide complete installation that is substantially noiseless in performance under intended use. Replace motors unsatisfactory to Architect with new motor.

3. Starters and Accessories

   a. Provide starters and disconnects for all HVAC equipment. Refer to Equipment Schedules.

   b. Furnish properly tagged and identified devices specifically indicated on "Electric Equipment and Control Schedule" as supplied by HVAC systems suppliers and determine coordinated location and time for delivery of devices.

   c. Provide auxiliary contacts required for temperature controls, interlock with other equipment, alarms, and similar components and applications.

B. Miscellaneous Electrical Wiring included in HVAC systems installations:

1. Provide all control wiring and power wiring for all equipment and associated control devices (including automatic control system) required for HVAC systems and components.

2. Comply with all applicable NEC requirements. Install all electric wiring in accordance with all local and state codes and regulations having jurisdiction.

3. Wiring for Controls: Provide wiring specified in Section 23 09 00 – Instrumentation and Control for HVAC, for all control devices required for temperature control system and other miscellaneous controls not included in "Electrical Equipment and Control Schedule".

4. Allow sufficient headroom under equipment as directed for each location (unit heater, etc.). Verify space available for each equipment item. Refer to Architect for any correction, discrepancy or suggested change in size of location.

5. Secure all equipment and fixture mountings, wiring devices, and accessories (clips, supports, etc.) to structure with screws, bolts, or similar items; nailing not acceptable.

END OF SECTION 23 05 13

SECTION 23 05 19 - METERS AND GAUGES FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gauges.
4. Gauge attachments.
5. Test plugs.
6. Electromagnetic flowmeters.

1.3 SUBMITTALS

A. Procedural Requirements: Comply with requirements of Section 01 33 00 - Submittals and as modified below.

1. Specified Products: If product to be incorporated into Project is specified by name and product designation in Part 2 below, submit "**As-Specified Verification Form**" (attached to Section 01 33 00 - Submittals) in lieu of "Product Data" identified below in this Article.

2. Equivalent Products or Substitutions: If product to be incorporated into Project is not specified by name and product designation in Part 2 below, comply with all Action Submittal requirements specified below.

B. Action Submittals:

1. Submit all action submittals required by this Section concurrently.

2. Product Data: For each type of product indicated, demonstrating compliance with specifications. Include schedules of locations and ranges proposed.

C. Closeout Submittals:

1. Approved submittal.

a. If "**As-Specified Verification Form**" submittal is approved, also include product data for all valves used.

2. Include all information required in Section 01 78 23 – Operation and Maintenance Data for all meters and gauges used. Include wiring diagrams for meter power, signal, and control wiring.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Trerice, H. O. Co.
   b. Weiss Instruments, Inc.
   c. WIKA Instrument Corporation - USA.
   d. Winters Instruments - U.S.

2. Standard: ASME B40.200.

3. Case: Cast aluminum; exterior grade powder coated finish, 9-inch nominal size unless otherwise indicated.

4. Case Form: Adjustable angle unless otherwise indicated.

5. Tube: Glass with magnifying lens and non-mercury blue or red organic liquid.

6. Tube Background: Non-reflective with permanently etched scale markings graduated in deg F.

7. Window: plastic.

8. Stem: Bare aluminum of length to suit installation.

9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.

10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing or Steel Piping: solid machined de-zincification resistant brass or stainless steel.
4. Type: Stepped shank unless straight or tapered shank is indicated.

5. External Threads: ASME B1.20.1 pipe threads, size as required for sensors.
6. Internal Threads: ASME B1.1 screw threads, size as required for sensors.
7. Bore: Diameter required to match thermometer bulb or stem.
8. Insertion Length: Length required to match thermometer bulb or stem.
9. Lagging Extension: Include on thermowells for insulated piping and tubing.
10. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin unless otherwise required by sensor manufacturer.

2.3 PRESSURE GAUGES

A. Direct Mounted, Dial Type Pressure Gauges:

1. 4-1/2-inch diameter flat white dials with black characters and graduations, micrometer style or externally adjustable zero point, providing 0.5 percent accuracy at mid scale and 1.0 percent accuracy full scale, certified to ANSI (ASME) B40.100 grade 1A with scales reading in psig.

2. Direct drive helically wound inconel bourdon tube movement with sapphire jeweled bearings or liquid filled stainless steel rotary type movement, rated for pump-mounted service, with bourdon tubes of seamless phosphor bronze alloy with silbrazed tips and forged brass sockets.

3. Impact resistant ABS, drawn steel or cast aluminum case with blow out grommet, snap ring, and “shatterproof” acrylic lens.

4. Provide ranges to read maximum design pressure at between 1/2 and 3/4 of maximum range.

5. Provide combination vacuum pressure gauges where indicated or required.

6. Provide 1/4-inch NPT connections located at bottom, lower back, or center back as required.

7. Provide five-year warranty.

8. Products: Provide one of the following:

   a. “TLG” by 3D Instruments or equal
   b. Ashcroft Duradrive model 1290 or equal
   c. Wika 232.34DD series or equal.

2.4 GAUGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with, ASME B1.20.1 pipe threads and piston or porous-metal-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: De-zincification resistant brass, bronze, or stainless-steel needle type, slow opening, bubble tight shutoff, with ASME B1.20.1 pipe threads.

2.5 FLOWMETERS

A. Electromagnetic Flow Meters:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Onicon, Inc.
2) Omega Engineering, Inc.
3) Siemens Energy & Automation, Inc.

b. Description: Electromagnetic, no moving parts.
1) Input Power: 20-28 VAC, 50/60 Hz, 250 mA. Maximum.
2) Liquid Temperature Range: 15° to 250°F.
3) Ambient Temperature Range: -20° to 150°F.
4) Operating Pressure: 400 PSI maximum.
5) Pressure Drop: Less than 0.1 PSI and 12 ft./sec. in 3" and larger pipes.
6) Accuracy: +/- 1.0% of reading from 2 to 20 ft./sec., +/- 0.02 ft/sec. below 2 ft/sec.
7) Output Signal:
a) Analog output (Isolated), selectable 4-20 mA, 0-10 V or 0-5 V.
b) Frequency output, 0-15 V peak pulse, 0-500 Hz maximum.
c) Scalable pulse output, isolated dry contact, contact rating 50 VDC @ 100 mA maximum, pulse duration: 0.5, 1, 2 or 6 seconds

c. Construction: 316L stainless steel, Xarec sensor head, powder coat paint cast aluminum, NEMA 4 enclosure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

A. Install meters and gauges adjacent to machines and equipment in easily readable position but protected locations to allow and facilitate service and maintenance of meters, gauges, machines, and equipment.

B. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees. Provide thermometer stems of length to match thermowell insertion length.

C. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes. For pipe sizes 1 inch and smaller, increase pipe size by one size at location of thermowell to minimize obstruction.

D. Install thermowells with extension on insulated piping. Insulate fitting past piping well and neatly terminate insulation at thermometer body minimizing heat loss while allowing for adjustment.

E. Fill thermowells with heat-transfer medium.

F. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

G. Install direct-mounted pressure gauges in piping tees with pressure gauge located on pipe at the most readable position.

H. Install valve and snubber in piping for each pressure gauge for fluids (except steam).

I. Install test plugs in piping tees in location that allows for ease of insertion of standard test kit probes.

J. Install flow indicators in piping systems in accessible positions for easy viewing.

K. Assemble and install connections, tubing, wiring, and accessories between flow-measuring elements, flowmeters and their controllers, and integrate with Energy Management and Control System as specified and as shown, all in accordance with manufacturer's written instructions.

3.3 Install flowmeter elements in accessible positions in piping systems.

3.4 LOCATIONS

A. Install thermometers in the following locations, and as additionally shown on drawings:

1. Inlet and outlet of each boiler, at boiler.
2. Mixed boiler supply water before reset.
3. Building supply heating water after reset.
4. Boiler water supply and return from domestic water heating tank.
5. Each inlet and outlet of each hydronic heat exchanger.
6. Inlet and outlet of each chiller, at chiller.

B. Install pressure gauges in the following locations:

1. One pressure gauge for each pump with 4 isolation ball valves and snubber, piped to read pressure before suction diffuser screen, at pump suction, at pump discharge, and atmospheric. Valve installed open to atmosphere for zero adjustment of each gauge.

2. One pressure gauge for each differential pressure sensor with 3 isolation ball valves and snubber, piped to read pressure in either supply, return, or atmospheric. Valve installed open to atmosphere for zero adjustment of each gauge.

3. One pressure gauge for each chiller with 3 isolation ball valves and snubber, piped to read pressure before and after chiller or atmospheric. Valve installed open to atmosphere for zero adjustment of each gauge.

4. One pressure gauge for each boiler with 3 isolation ball valves and snubber, piped to read pressure before and after boiler or atmospheric. Valve installed open to atmosphere for zero adjustment of each gauge.

5. One pressure gauge for each side (heated and cooled) of each heat exchanger, two per heat exchanger, each with 3 isolation ball valves and snubber, piped to read pressure before and after heat exchanger or atmospheric. Valve installed open to atmosphere for zero adjustment of each gauge.

C. Flowmeters

1. Install flowmeters where shown on the drawings.

3.5 ADJUSTING

A. After installation, calibrate meters and gauges according to manufacturer's written instructions. Coordinate calibration with Testing and Balancing Agency (TAB) and include results in TAB report.

B. Adjust faces of meters and gauges to proper angle for best visibility.

3.6 THERMOMETER TYPE SCHEDULE

A. Thermometers in interior locations that are temperature controlled to within the operating limits of the equipment shall be the following:

1. Direct-mounted, light-activated type.

B. Thermometers in exterior locations or interior locations designed to range outside of the normal operation conditions of light activated thermometers shall be the following:

1. Industrial-style, liquid-in-glass type.

3.7 THERMOMETER SCALE-RANGE SCHEDULE

A. Provide thermometers of approximately the scale range indicated:

1. Scale Range for Chilled-Water Piping: 0 to 100 deg F.
2. Scale Range for Heating, Hot-Water Piping: 30 to 250 deg F .
3. Scale Range for Outside Air: Minus 20 to plus120 deg F.

3.8 PRESSURE-GAUGE TYPE SCHEDULE

A. Pressure gauges shall all be direct drive as specified.

3.9 PRESSURE-GAUGE SCALE-RANGE SCHEDULE

A. Scale Range for Building Chilled-Water Piping: 0 to 100 psi.
B. Scale Range for Heating, Hot-Water Piping: 0 to 100 psi

END OF SECTION 23 05 19

SECTION 23 05 23 – GENERAL DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Brass and bronze ball valves.
2. Iron, single-flange butterfly valves.
3. Iron, grooved-end butterfly valves.
4. Pump Discharge Valves.
5. Air vent valves
6. Chainwheels.

1.3 DEFINITIONS

A. CWP: Cold working pressure.
B. EPDM: Ethylene propylene copolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.4 SUBMITTALS

A. Procedural Requirements: Comply with requirements of SECTION 01 33 00 - Submittals and as modified below.

1. Specified Products: If product to be incorporated into Project is specified by name and product designation in Part 2 below, submit "**As-Specified Verification Form**" (attached to SECTION 01 33 00 - Submittals) in lieu of "Product Data" identified below in this Article.

2. Equivalent Products or Substitutions: If product to be incorporated into Project is not specified by name and product designation in Part 2 below, comply with all Action Submittal requirements specified below.

B. Action Submittals:

1. Product Data: Submit concurrently for each type of valve proposed, demonstrating compliance with requirements.

C. Closeout Information, for inclusion in Operations and Maintenance Manual:

1. Approved submittal.

    a. If "**As-Specified Verification Form**" submittal is approved, also include product data for all valves used.

2. Include all information required in SECTION 01 78 23 – Operation and Maintenance Data.

3. Receipt: For spare automatic flow control valve cartridges and Differential Pressure Flow Test Kit(s).

4. Valve Chart: Refer to Section 23 05 00 – Common Work Results for HVAC, for details.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set ball and plug valves open to minimize exposure of functional surfaces.
4. Set butterfly valves closed or slightly open.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 6 and larger.

2. Handlever: For quarter-turn valves NPS 5 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

2. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE AND BRASS BALL VALVES

A. Two-Piece Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Milwaukee Valve Company.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Solder or Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full or Regular per application schedule.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Conbraco Industries, Inc.; Apollo Valves.
   b. Milwaukee Valve Company.
   c. NIBCO INC.

2. Description:

   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 150 psig.
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 216 carbon steel, ASTM A 126, cast iron or ASTM A 536, ductile iron.
   e. Seat: EPDM/Teflon, reinforced, resilient, for water temperatures up to 250 deg. F at 150 PSI.
   f. Stem: 316 or 416 stainless steel shaft mounted within corrosion resistant bearings.
   g. Disc: Aluminum bronze, bronze, or nickel coated iron.

2.4 IRON, GROOVED-END BUTTERFLY VALVES

A. 300 CWP, Iron, Grooved-End Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Anvil International, Inc; “Gruvlock”.
   b. NIBCO INC.
   c. Victaulic Company.

2. Description:

   a. Standard: MSS SP-67, Type I.
   b. NPS 8 and Smaller CWP Rating: 300 psig.
   c. Body Material: Coated, ductile iron.
   d. Stem: Two-piece stainless steel.
   e. Disc: EPDM/Teflon coated ductile iron.
   f. Seat: EPDM/Teflon, reinforced, resilient, for water temperatures up to 250 deg. F at 150 PSI.

2.5 PUMP DISCHARGE VALVES

A. Provide pump discharge valve for each new pump and as otherwise noted on drawings.

1. For constant speed pump applications, provide pump manufacturer's "triple duty valve" sized to provide maximum 3 feet water gauge pressure drop at the design flow.

2. For variable speed pump applications, provide either pump manufacturer's "triple duty valve" or a combination of a venturi measuring station, non-slam check valve, and isolation valve, all as specified. Size to larger of full line size or as required to provide maximum 3 feet water gauge pressure drop at the design flow.

B. Pump manufacturer's "triple-duty valve":

1. 175-psig pressure rating, cast-iron body of angle or straight pattern.

2. Globe style combination shutoff, calibrated multi-turn flow throttling / measuring, and spring loaded non-slam check valve.

3. Include gage ports with integral check valve, and provision for attaching a portable differential pressure meter, with each meter connection having positive shutoff access valves.

4. Provide with removable insulating cover providing minimum R value of 5.

C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. "Model 3D Triple Duty Valve" by Bell & Gossett.
2. Armstrong.
3. Paco.
4. Victaulic.

2.6 AIR VENTS

A. Manual Air Vents:

1. For All Pipe Sizes In Accessible Locations Only: Bronze body, quarter turn ball valve with minimum ¼-inch discharge and inlet connections. Provide collection chamber at inlet and ¼-inch tube with return bend on outlet, piped to point of collection.

2. For Terminal Units In Accessible Locations: Bronze or brass body and non-ferrous internal parts, 150 PSIG working pressure, 225 deg. F operating temperature. 1/8-inch MNPT inlet connection. Coin or key operated, supply three keys minimum to owner. Similar to "Model 4V" by Bell & Gossett.

B. Automatic Air Vents:

1. High Capacity Type: Cast iron body with internal working parts of stainless steel, brass, bronze, and EPDM and float-operated sealing valve designed to purge free air from the system and provide positive shut off at pressures to 125 PSIG and temperatures to 250 deg. F. Vent prevents air from entering the system if system pressure drops below atmospheric. Vent readily serviceable by disassembly to access the internal working parts. Similar to "Model "107A" by Bell & Gossett or "720" by Amtrol.

2. Standard Capacity Type: Cast bronze body with internal working parts of stainless steel, brass, bronze and EPDM and float operated sealing valve designed to purge free air from the system and provide positive shut off at pressures to 150 PSIG and temperatures to 230 deg. F. Vent prevents air from entering the system if system pressure drops below atmospheric. Vent readily serviceable by disassembly to access the internal working parts. Similar to "No. 700-C" or "701-C" by Amtrol.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage. Verify dielectric bolt kits are provided for flanged connections between dis-similar materials.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Install special purpose hydronic valves (safety relief valves, reduced pressure zone backflow prevention devices, pressure reducing valves, etc.) as specified in section 23 21 13 – Hydronic Piping.

B. Install isolation valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

1. Install boiler isolation valves on system side of boiler specialty components especially safety components like relief valves and low water cutoff devices.

C. If valves with specified CWP ratings are not available, the same types of valves with higher CWP ratings may be substituted.

D. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 inch and Smaller: Threaded or solder joint ends.
2. For Copper Tubing, NPS 2-1/2 inch and larger: Flanged ends.
3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
4. For Steel Piping, NPS 2-1/2 inch and Larger: Flanged or grooved ends.

3.3 GENERAL DUTY VALVE SCHEDULE

A. Unless otherwise specifically indicated elsewhere, use the following:

B. Hydronic Flow Shutoff Service:

1. 2 inch and smaller: Full Port Ball Valves
2. 2-1/2 inch and larger: Butterfly Valves.

C. Pressure Gage Shutoff Service: Standard or Full Port Ball valves.

D. Pump Service:

1. Suction: Provide full line size isolation valve at pump inlet before reducers, flex connections, and suction diffuser.

2. Discharge:

a. Constant speed pumps: Provide Pump Discharge Valves by pump manufacturer, full line size of system piping (typically larger than pump discharge size), after flex connections.

b. For VSD driven pumps, the pump discharge valve may consist of a manufacturer's triple duty valve or alternately a combination of a venturi measuring station as specified in Section 23 05 19, a non-slam check valve, and an isolation valve.

c. Install with sufficient length of straight pipe before and after valve as recommended by manufacturer to obtain good and stable measurements.

E. Hydronic System Drain Service: Provide drain valves at all system local or global low points as required for complete system drainage.

1. 2-1/2 inch and larger service: Provide ¾ inch full port ball valves with ¾ inch hose thread end and chained cap.
2. 2 inch and smaller service: Provide ¾ inch full port ball or globe valves, with ¾ inch hose thread end and chained cap.

F. Hydronic System Air Venting:

1. Manual vents: provide standard or full port ball valve, minimum 1/4" NPT; ½" NPT on 4" and larger piping.

2. Provide Standard Capacity Type Automatic Air Vent at accessible points in piping system where air may collect, including all local high points and at the end of each horizontal run before a drop in elevation.

a. If any such point will be inaccessible after construction is complete, provide only Manual Air Vent in lieu of automatic, installed as described below.

3. Equipment Air Vents:

a. Provide High Capacity Automatic Air Vent above each air and air/solids separator.

b. Boilers: Provide High Capacity Automatic Air Vent.

c. Equipment Above Mains: Connect run outs or risers to upper quadrant or top of mains. Install vent assembly at branch high point, concealed within enclosure if possible, consisting of 1 in. diameter by 6 in. long air collection chamber with 1/4 in. soft copper tube to manual valve. Mount securely near bottom of enclosure, but not fastened to enclosure. For individual units, radiators, fan convectors and units with return grilles: Provide coin air vent valve, operated from discharge grille or access door. Positioning of valve shall not interfere with removal of enclosure.

d. Equipment Below Mains: Connect piping run outs or risers to bottom or lower quadrant of mains. Vent assembly not required in unit. Provide means of purging and draining each unit. Use tees instead of ells at low point of run outs.

3.4 VALVE INSTALLATION

A. When installing solder-joint end valves, protect valve body from soldering heat using water soaked rags or other heat sink method as required to avoid valve damage. Leaking stems or seats on solder-joint end valves shall be subject to immediate replacement with new valve.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem and handle movement.

E. Install all Automatic Air Vents above manual vent assembly described below, with discharge piped to point of collection - for venting, pipe discharge to chemical feed station as shown, or if not shown to minimum 1 quart clear plastic container, secured and removable for service.

3.5 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 23 05 23

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC COMPONENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 06 section “Roofing Rough Carpentry” for roof mounted support blocking.

1.2 SUMMARY

A. Section Includes

1. Hangers and supports for (but not limited to) following components:

a. Piping hangers and supports
b. Duct hangers and supports
c. Equipment hangers and supports

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. This section does not detail mechanical vibration, movement, wind load, or seismic control requirements. Refer to Section 23 05 43 – MECHANICAL VIBRATION AND MOVEMENT CONTROL and Section 23 05 48 – MECHANICAL SEISMIC AND WIND LOAD CONTROL for additional hanger and support requirements.

B. Provide corrosion resistant construction as described below for hangers, hanger rods, supports, fittings, hardware, etc, unless otherwise noted or approved. Note that not all products described below are available in corrosion resistance as required for all applications listed – select appropriate corrosion resistant products as required. Multiple conditions may apply, in which case the more corrosion resistant construction is required:

1. General purpose indoor: ASTM B-633 Fe/Zn 25 minimum zinc plated fasteners, ASTM B-653 G90 minimum sheet steel, factory baked enamel paint, or anodized.

2. In contact with copper: Copper plated for size identification and felt lined or plastic coated.

3. In contact with aluminum: Same aluminum alloy as equipment or 300 series stainless steel. 300 series stainless steel fasteners.

4. Outdoors: 300 series stainless steel or post-fabrication (after forming, welding, drilling, etc.) ASTM A-153 hot dipped galvanized steel, minimum coating thickness 3 mils.

5. Miscellaneous fabricated custom supports, anchor bases, etc..: painted in accordance with Section 23 05 00 – COMMON WORK RESULTS FOR HVAC.

C. Allowable Working Loads:

1. Use only manufacturer's load rated hangers, supports, and fasteners designed and rated for the intended service.

2. Do not load connectors, hangers, or supports to more than the manufacturers′ recommended working load or the following:

a. Use a safety factor of 5:1 minimum with respect to manufacturers′ published ultimate shear strength.
b. Use a safety factor of 10:1 minimum with respect to manufacturers′ published ultimate tension or pull-out strength.

D. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, service loads, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product literature, technical specifications, and other data required to demonstrate compliance with specified requirements for following components:

1. Hangers and supports

B. Shop Drawings: Submit intended custom support construction for approval.

C. All supports, etc., shall meet the approval of the Architects / Engineers. Submit shop drawings showing fabrication and installation details including calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.
5. Include detailed layout and loading drawings for all above roof piping and equipment.

1.6 QUALITY ASSURANCE

A. Comply with applicable requirements of following standards for all hangers and supports:

1. MSS-SP-58 Pipe Hangers and Supports – Materials, Design, and Manufacture.
2. MSS-SP-69 Pipe Hangers and Supports – Selection and Application.
3. ANSI / ASME Code for Pressure Piping B 31.1
4. ASTM standards for corrosion resistant Zinc coatings.
5. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
6. UL 203 Standard for Pipe Hanger Equipment and Fire Protection Service
7. Metal Framing Association MFMA-2
8. ANSI/ NFoPA NDS - National Design Specification for Wood Construction
9. SMACNA – Sheet Metal and Air Conditioning Contractor's National Association, Inc.

PART 2 - PRODUCTS

2.1 GENERAL

A. For convenience, details and specifications have been based on product types as defined in MSS SP-58 and 69 where applicable, and, where not applicable, catalog numbers shown have been based on products by the listed manufacturers.

2.2 PIPING ATTACHMENTS

A. Individually Suspended Horizontal Rigid Piping or Tube Attachments:

1. Band type:

   a. 1-1/4 inch diameter pipe size and less only.
   b. Formed steel loop overlapped at top with rod sized hole or insert nut. With or without side insert closure.
   c. MSS SP-58 type 5, 6, or 10.

2. Clevis type:

   a. Any size pipe or tubing.
   b. Formed steel bands top and bottom connected by sheer bolt.
   c. MSS SP-58 type 1.

3. Roller type:

   a. Any size pipe or tubing.

   b. Radiused or angled roller and steel axle; yoke for single hanger rod or end sockets for double rod applications. Designed to accommodate longitudinal movement through roller action.

   c. MSS SP-58 type 41 and 43.

4. Provide products by one of the following manufacturers:

    a. B-Line Systems, Inc., Highland Illinois, or equal
    b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
    c. Grinnell Corporation; Pipe Support Division, Cranston, Rhode Island, or equal.

B. Supported from below Horizontal Rigid Piping or Tube Attachments:

1. Split Ring type:

    a. 1-1/4 inch diameter pipe size and less only.

    b. Cast malleable iron split ring with steel pivot and bolt, cast boss on one side threaded for standard rod or pipe attachment. Designed to accommodate minimal longitudinal movement only.

    c. MSS SP-58 type 12.

2. Roller type:

    a. Any size pipe or tubing.

    b. Radiused or angled roller and steel axle with end sockets for double rod applications. Provide with U-bolt upper restraint. Designed to accommodate longitudinal movement through roller action.

    c. Roller MSS SP-58 type 41 and U-bolt MSS SP-58 type 24.

3. Provide products by one of the following manufacturers:

    a. B-Line Systems, Inc., Highland Illinois, or equal
    b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
    c. Grinnell Corporation; Pipe Support Division, Cranston, Rhode Island, or equal.

C. Group Supported or Suspended (Trapeze) Horizontal Rigid Piping or Tube Attachments (Common Support Beam):

1. Support frame or trapeze beam of load rated brackets or channel strut product.

2. U-Bolt type:

    a. Any size pipe or tubing.

    b. Insulation support system rests directly on beam or shim, with U-bolt or split strut clamp upper restraint. Designed to accommodate minimal longitudinal movement only.

    c. U-bolt MSS SP-58 type 24, Strut clamp similar to B-Line “B-2000” series.

3. Radius Roller type:

    a. Any size pipe or tubing.

b. Radiused roller and steel axle with end sockets for double rod applications. Provide with U-bolt upper restraint. Designed to accommodate longitudinal movement through roller action.

c. Roller MSS SP-58 type 41 and U-bolt MSS SP-58 type 24.

4. Provide products by one of the following manufacturers:

a. B-Line Systems, Inc., Highland Illinois, or equal
b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
c. Grinnell Corporation; Pipe Support Division, Cranston, Rhode Island, or equal.

D. Individual Vertical Rigid Piping and Tube Attachments:

1. Split Ring type:

a. 1-1/4 inch diameter pipe size and less only.

b. Cast malleable iron split ring with steel pivot and bolt, cast boss on one side threaded for standard rod or pipe attachment. Designed to accommodate minimal longitudinal movement only.

c. MSS SP-58 type 12.

2. Provide products by one of the following manufacturers:

a. B-Line Systems, Inc., Highland Illinois, or equal
b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
c. Grinnell Corporation; Pipe Support Division, Cranston, Rhode Island, or equal.

E. Piping Insulation Protection Systems:

1. Pipe Insulation Shields:

a. One Piece:

1) Formed steel, minimum 18 gauge thickness, longer of 2 times diameter or 12-inch long minimum, and 180 degree circumference, sized for insulation thickness.

2) MSS SP-58/69 type 40.

b. Two Piece Sliding:

1) Manufactured two piece sliding shield system designed to accommodate thermal movement.

2) MSS SP-58/69 type 40 inner shield similar to one piece shield above adhered to pipe insulation, with second outer shield of formed steel, minimum 18 gauge thickness, one times diameter length 6-inch long minimum, and 180 degree circumference, sized to fit outside inner shield, with formed ribs to keep shield centered on support clevis or trapeze.

3) Inner and outer shields separated by layer of PTFE (Teflon), minimizing friction between shields and allowing minimum four inches controlled pipe movement relative to hanger without insulation damage or outer shield moving past the end of the inner shield.

2. Type “A” Insulation Protection System:

   a. 1” piping and smaller only.
   b. Provide one piece or two piece sliding shield as required by distance from piping anchors.

3. Type “B” Insulation Protection System:

   a. 1¼” through 8” heating piping only.

   b. Provide one piece or two piece sliding shield as required by distance from piping anchors.

   c. Pipe Support Insulation: High density 20 pcf. molded fiberglass blocks consisting of fiberglass wool and urea-phenolic resin cured binder. Provide number and size of support blocks as required to limit deflection to 1% and avoid long-term damage to vapor barrier, and as required for pipe size and insulation thickness, in accordance with manufacturer’s written guidelines and project details. Seal cut in piping insulation vapor barrier using manufacturer’s recommended matching tape. Similar to AHAMFAB H-Block" by ICA

4. Type “C” Insulation Protection System:

   a. Acceptable for any size heating or cooling piping.

   b. Manufacturer’s assembly consisting of insulation shield, high compressive strength insulation, and vapor barrier covering. May include hanger also.

   c. Hanger: As required above, secured to shield and support insulation.

   d. Insulation Shield: Provide one piece or two piece sliding shield as required by distance from piping anchors.

   e. High Compressive Strength Insulation: 180 or 360-degree circumference insulation insert formed of water resistance treated hydrous calcium silicate (untreated cal-sil not acceptable) or cellular glass insulation, same thickness as adjacent insulation.

   f. Vapor Barrier Covering: White kraft outer surface bonded to aluminum foil, sandwiching reinforcing fiberglass skrim yarn, permanently treated for fire and smoke safety and to prevent corrosion of the foil, with a vapor transmission perm rating of 0.02 or less. Seal to piping insulation vapor barrier using manufacturer’s recommended matching tape.

   g. Similar to Models “123”, “124", “1031”, and “4031” by ERICO/Michigan Hanger.

5. Provide products by one of the following manufacturers:

a. B-Line Systems, Inc., Highland Illinois, or equal
b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
c. ICA Inc.; Lehighton, Pennsylvania, or equal.
d. Buckaroos, Inc.

2.3 DUCT ATTACHMENTS

A. Per SMACNA Duct Manual standards for size, height, and location of ductwork, and as noted below.

1. Materials and corrosion resistance as listed above.

2. SMACNA load tables allow for no external loads on duct: provide for 200 lb external load on all duct hangers and supports. Increase hanger and support sizes from SMACNA tables accordingly:

a. Minimum band size 20ga. x 1 inch.
b. Duct 48” wide and larger; provide trapeze style support of metal channel framing or angle iron, suspended from threaded rods.

3. Hanger bands to extend down sides and turn under bottom 1 inch minimum for all duct sizes. Minimum (2) #10 sheet metal screws per hanger (one each on side and bottom), (2) screws minimum on sides for duct over 12 inches tall, 12 inches on center max.

4. Round exposed duct: hang from twin half round bands and rods, or as otherwise detailed.

2.4 BUILDING ATTACHMENTS

A. Structural Steel Connectors:

1. C-Clamp style:

a. FM approved, U.L. listed, steel or malleable iron C-clamp with hardened set screw and lock nut, tapped for rod size, typically eccentrically loads structure.
b. Hanger rod bypasses structure: MSS SP-58 type 19.
c. Hanger rod in line with set screw: MSS SP-58 type 23.

2. Center Loading Beam and Channel Clamp Style:

a. Forged or formed steel or malleable iron construction, beam clamps with connection for concentrically loading structure, of types as required by loading and configuration.

b. MSS SP-58 types 21, 27, 28, 29, and 30.

3. Pivoting or Adjustable Connection Style:

a. Structural welding lug with forged steel clevis, side beam bracket, or other appropriate pivoting beam clamps as required for sloped steel.

b. Use for sloped steel, where thermal movement requires pivot, where seismic controls requires non-moment building connection, and elsewhere as required.
c. MSS SP-58 types, 21 or 22 with 16 or 17, 34, 57 with 14, etc...

4. Provide products by one of the following manufacturers:

a. B-Line Systems, Inc., Highland Illinois, or equal
b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
c. Grinnell Corporation; Pipe Support Division, Cranston, Rhode Island, or equal.

B. New Concrete Connectors:

1. Cast in Place Insert Style:

a. Carbon steel or malleable iron concrete insert, tapered slot retains internally threaded nut. Insert [12-inch x 1/2-inch] [300-mm x 15-mm] reinforcing rod through top of insert in pipes [6 inch] [150 mm] and larger.

b. MSS SP-58 type 18.

2. Cast in Place Threaded Stud Type:

a. Steel threaded rod inserted through steel deck before concrete pour, nut on both sides of deck to retain before pour, with offset at top for positive connection to cured concrete consisting of bent rod, welded top plate, nuts/washer, etc.

b. Similar to “Model No. 370A" by ERICO/Michigan Hanger.

3. Provide products by one of the following manufacturers:

a. B-Line Systems, Inc., Highland Illinois, or equal
b. ERICO/Michigan Hanger Co.; Solon, Ohio, or equal
c. Grinnell Corporation; Pipe Support Division, Cranston, Rhode Island, or equal.

C. Existing Concrete Connectors

1. Self-energizing tapered expansion bolt/sleeve: GSA specification FF-S-325, Group II, Type 3, Class 3, UL Listed, FM approved, complete with split expansion sleeve, washer, and hex head nut; similar to “Rawl Lok/Bolt” by Rawlplug.

2. Dual-Interlocking Expansion Wedge Stud: GSA specification FF-S-325, Group II, Type 4, Class 1, UL Listed, FM approved, complete with split expansion sleeve, washer, and hex head nut; similar to “Rawl-Stud” by Rawlplug.

3. Dual-Interlocking Expansion Wedge Threaded Rod Anchors: UL Listed, FM approved, complete with split expansion sleeve; similar to “Rod Hanger Wedge Anchor” by Rawlplug.

4. Provide products by one of the following manufacturers:

a. Hilti, Inc.; Tulsa, Oklahoma, or equal
b. Ramset/Red Head; Michigan City, Indiana, or equal

c. Rawlplug Co. Inc.; New Rochelle, New York, or equal.

2.5 EQUIPMENT SUPPORTS

A. Provide custom designed hangers and supports to properly and resiliently support all contract equipment as required by special circumstances encountered. Suspend from above or support from below as shown on drawings and as required.

B. Use structural carbon steel plate and shapes, secured by welding or bolts as required.

C. Use load rated fasteners full size of the component attachment points unless specifically requested and approved otherwise.

D. Provide lateral bracing as required minimizing potential for sway.

E. Fabricate as required to transmit loads and reaction forces to structure, in accordance with applicable details and layouts shown on Drawings, and as approved by Architect. Submit load calculations and fabrication details for approval for all such supports including verified coordinated dimensions, weights, etc., of mechanical component, support component, and building structure proposed.

2.6 MISCELLANEOUS COMPONENTS AND ACCESSORIES

A. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

B. Threaded Rods, Bolts, Nuts, Washers, Metals, Hardware, and Miscellaneous Assembly Components:

1. Provide manufacturer's load rated fasteners with size, strength and corrosion resistance as required for the application.

2. Rods, bolts, machine screws: rolled forged ANSI B1 Class 2A or better thread, bolts and screws with heads as required by the application, length as required for full thread engagement of but minimal projection past receiving connector including building attachment, (double) nuts, equipment attachment, etc.

3. Nuts: heavy pattern where space permits and where subject to repeated operation, ANSI B1 Class 2B or better thread.

4. Washers: US pattern where space permits, SAE pattern otherwise, with toothed or split lock washer when attached to equipment with moving or vibrating parts.

5. Sheet metal screws: self drilling, thread forming, hardened steel (hardened SS as required), load rated screws with hex heads designed for power driving

6. Structural Steel: ASTM A 36/A 36M, carbon-steel, black and galvanized, and/or series 300 Stainless Steel plates, bars, angles, channels, and other shapes in thickness and size as required for load.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which hangers and supports are to be installed and notify Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.

1. When Contractor confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Architect written confirmation. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Contractor.

2. Identify any discrepancies between specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work required by discrepancies after installation at Contractor's expense.

3.2 GENERAL INSTALLATION

A. Provide complete hanger and support systems for piping and ductwork systems and equipment, including all necessary attachments, fasteners, threaded rods, bolts, miscellaneous hardware, and associated work as required.

B. Provide specified products, installed in accordance with applicable sections of this specification, in accordance with the manufacturer's recommended installation instructions, and as detailed on the Drawings.

C. Support pipe, duct, and equipment from the building structure.

1. Provide approved miscellaneous support structure as required to attach hangers and supports to building structure in conformance with all applicable standards and related specification sections.

2. Do not use chain, perforated hanger strapping or band, wire hangers, or kinked, bent, or otherwise damaged hangers and supports.

3. Do not support one pipe from another, one duct from another, pipe from duct or equipment, or any similar combination.

4. Install lateral bracing with pipe hangers and supports as required to prevent swaying.

5. Provide special hangers and supports as shown on the drawings, as required to suit existing conditions, and as required for proper installation of equipment.

D. Coordinate the installation with applied fireproofing and where possible install attachments to structure prior to fireproofing. Where prior installation is not possible, repair fireproofing as required.

1. Repair or replace any fireproofing removed or damaged during installation of components.
2. Ensure repaired or replacement fireproofing continuously matches or exceeds rating of adjacent fireproofing and ensure that all warranties are maintained.

E. Load Distribution: Install hangers and supports so that live and dead loads and stresses from movement will not be transmitted to connected equipment.

3.3 PIPE HANGER AND SUPPORT INSTALLATION

A. Comply with MSS SP-58 and MSS SP-89 and as specified below. Install hangers, supports, clamps, and attachments as required properly supporting piping from the building structure.

B. Trapeze Pipe-Hanger Installation: Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. Field fabricate from manufactured slotted channel system or structural shapes selected for loads being supported.

C. Size piping attachments for insulated piping to fit outside insulation. Size piping attachments for un-insulated piping to fit outside diameter of pipe.

D. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping. Provide for slope of trapeze supported piping systems with adjustable individual piping attachments.

E. Accommodate thermal movement of piping systems.

1. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

2. Provide rods of sufficient length for ample swing. Hang rods from high points to allow maximum swing.

3. Hang piping so that rods are vertical at the design temperature.

4. Where length of rod and thermal expansion combine to cause more than 4 degrees angular movement of rod (or 1 inch lateral movement in a 12 inch rod), provide suitable linkage to permit swing and limit rods to tensile loading only, or, provide pipe roll.

5. Where length of rod and thermal expansion would combine to cause more than 10 degrees angular movement of rod (or 2 inch lateral movement in a 12 inch rod), provide pipe roll.

6. More thermal movement is expected as the straight line distance from piping anchor points increases. Unless unusually long hanging rod length allows swing as indicated above, provide pipe roll hangers and supports at or above the following distances from piping anchor points indicated on drawing or installed in field. Deviations from below values subject to pre-approval:

Piping Service		Distance from Anchorage
a.	Individual Copper Cooling Service	100 ft.
b.	Individual Copper Heating Service.	35 ft.
c.	Trapeze Copper Cooling Service	60 ft.
d.	Trapeze Copper Heating Service.	20 ft
e.	Individual Steel Cooling Service	140 ft.
f.	Individual Steel Heating Service.	60 ft.
g.	Trapeze Steel Cooling Service	80 ft.
h.	Trapeze Steel Heating Service.	50 ft

F. Pipe Hangers and Supports Spacing (Maximum):

1. Provide hanger or support as close as possible to and within 24 inches of any elbow.

2. Provide hanger or support on branch pipe within 24 inches of main at takeoff / tee.

3. All Horizontal / Sloped Heating and Cooling Piping Systems:

Piping Material		Maximum spacing of hangers
a.	Copper ¾ in. and smaller	5 ft.
b.	Copper 1 in. and 1-¼ in.	6 ft.
c.	Copper 1½ in. and larger	8 ft.
d.	Steel 1¼ in. and smaller.	7 ft
e.	Steel 1½ in.	9 ft.
f.	Steel 2 in. and larger	10 ft.

4. Vertical Piping:

a.	Steel and Copper 1¼ in and smaller	Two per floor level.
b.	Steel and Copper 1½ in and larger	One per floor level.

G. Insulated Piping

1. Center insulation shields at piping attachments and secure shield from lateral movements by wrapping PVC tape around circumference of piping insulation and shield at both ends of shield.

2. At all piping attachments, provide piping insulation protection system of strength and configuration required to guarantee integrity of pipe insulation and associated vapor barrier. Refer also to SECTION 23 07 00 INSULATION.

3.4 BUILDING ATTACHEMENTS INSTALLATION

A. Threaded Rod for Hangers:

1. Double nut each end of each rod. Threaded clamp, turnbuckle, etc. counts as one nut.

2. Rod size for individual pipe hangers and two rod / two pipe or duct trapeze style supports:

Rod size:	for Pipe size:	for Duct size:
3/8”	2” and smaller.	48” wide to 72”
1/2”	2-1/2" and 3".	Over 72” wide
5/8”	4" and 5".	
3/4”	6".	

3. For multiple pipe or duct trapeze style supports with two rods for more than two pipes or two or more ducts, size rods according to manufacturers recommended safe working loads taking into account total hung weight, 200 pound live load, as well as capacity of structure; each rod not smaller than size shown above for largest pipe or the sum of the duct width in the trapeze. Submit details of all such supports and connectors for approval before construction, including schedule of proposed sizes and capacities.

B. Fastener Systems: Provide screws, bolts, approved anchors, etc., to secure piping, duct, equipment, supports, and miscellaneous components and accessories to structure. Nailing not permitted.

1. Install all fastener systems and anchorage in strict accordance with fastener manufacturer’s instructions and as otherwise indicated below.

2. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, and flanges NPS 3” and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

3. Minimize eccentric loading of structure as follows:

   a. For paired point loads eccentrically suspended (C-clamp attached supply and return pipes, etc), suspend from opposite edges of structural member.

   b. For point loads over 400 pounds, use center loading beam clamps or other structurally concentric building attachment, and confirm proposed configuration with Engineer by submittal.

4. For connections cast in place to new concrete, assume concrete strength as specified. Do not apply loads to freshly cured concrete until written approval is received from contractor responsible for concrete strength.

5. For connection to existing concrete:

   a. Connect only to sound concrete free of evidence of deterioration.

b. Do not install connections or apply loads to recently cast curing concrete until written approval is received from contractor responsible for concrete strength. Use compressive strength certified by ASTM approved test results.

c. For older existing concrete and in the absence of ASTM approved tests certifying otherwise, assume a concrete compressive strength of $f'c$ = 3000 psi.

d. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use powder-actuated fasteners in precast concrete or in pull-out tension.

3.5 DUCT HANGERS AND SUPPORTS

A. Install per SMACNA duct manual and as modified by the requirements of this section.
B. Provide support spacing per building structural system but not greater than 8 feet. Provide extra support structure as required.

3.6 ELECTRICAL WORK HANGER AND SUPPORT INSTALLATION

A. Refer to Division 26 complete.

3.7 ADJUSTING

A. Adjust all hangers and supports after installation of piping and associated equipment to distribute loads equally on attachments and to achieve proper pitch for the applicable piping system.

B. Trim excess length of continuous-thread hanger and support rods as required - avoid hazardous protrusion.

3.8 PAINTING AND TOUCHUP

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 23 05 29

SECTION 23 05 43 – MECHANICAL VIBRATION AND MOVEMENT CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes mechanical movement controls for all mechanical equipment and components, piping, and duct work provided or modified as a part of this Project and as noted on the drawings, whether movement is from sound, vibration, thermal, or other sources including (but not limited to):

1. Vibration isolation hangers and mounts for equipment, piping, and ductwork.
2. Flexible piping and flexible piping connections.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1.4 PERFORMANCE REQUIREMENTS

A. Provide mechanical sound, vibration, and movement control for all mechanical equipment, piping, duct work, and other components provided or modified as a part of this Project, and as shown on the Drawings. Mount on or suspend from vibration isolators to reduce transmission of vibration and mechanically transmitted sound to building structure. Select vibration isolators in accordance with weight distribution to produce reasonably uniform deflections.

1. Correct any variance or non-compliance with specified requirements in manner directed by Architect.

1.5 SUBMITTALS

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

B. Action Submittals:

1. Product Data for the following:

2. Catalog cuts and data sheets on Vibration isolation hangers, piping, and flexible piping connections.

3. Shop Drawings

a. Submit details of following items

1) Isolation hangers and systems for ceiling hung equipment, piping and ductwork.

2) Mountings for floor supported equipment, piping and ductwork.

3) Complete flexible connector details.

b. Indicate deflections and model numbers on all hanger, mounting or pad drawings including any other specified requirements.

c. Provide in tabular form spring diameters, rated loads and deflections, heights at rated load and closed height for all springs shown in submittals.

C. Informational Submittals:

1. Product Certificates:

a. Contractor Statement of Responsibility: Refer to Division 01 Section, “Quality Requirements”.

2. Welding certificates.

D. Closeout Submittals:

1. Field quality-control test reports.

2. Contract Closeout Submittals: Comply with requirements of Section 01 73 00, including submission of operating and maintenance instructions as item in "General Construction Instructions" manual described in that section.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 COORDINATION

A. Coordinate layout and installation of vibration isolation and movement control devices with other construction that penetrates ceilings or is supported by, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate size and location of concrete housekeeping pads and vibration isolation bases. Cast anchor-bolt inserts into base. Refer to applicable technical sections in Division 03 for concrete, reinforcement, and formwork requirements**.**

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

D. Coordinate design of vibration isolation design with expansion compensation systems.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control.
3. Mason Industries.

B. Factory Finishes: Provide manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanized metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation devices to indicate capacity range.

C. Where neoprene is referred to and used in vibration isolation components, it shall be bridge-bearing grade premium neoprene of the durometer hardness grade and size specifically recommended by the design make manufacturer for both maximum vibration isolation and load rated for the specific application.

D. Isolation Mountings

1. Neoprene Mountings: Provide minimum static deflection of 0.35-inch with all metal surfaces neoprene-covered and having friction pads both top and bottom.

a. Bolt holes provided on base, isolated from tapped bolt hole with cap screw on top.
b. Steel frame bases used above mountings to compensate for overhang.
c. Basis-of-Design Product: Mason Industries, Inc.; Type ND or Rails Type DNR.

2. Restrained Neoprene Mountings: OSHPD pre-approved vibration isolation mounts with captive opposed neoprene inserts, minimum static deflection of 0.2-inch.

a. Restraint rated at 2G minimum in all directions.
b. Plated steel frame with base mounting holes, isolated from tapped bolt hole with cap screw on top.
c. Basis-of-Design Product: Mason Industries, Inc.; Type BR.

3. Spring Isolators: Freestanding and laterally stable without housing and complete with molded neoprene cup or 1/4-inch neoprene acoustical friction pad between base plate and support.

    a. All mountings with leveling bolts rigidly bolted to equipment.
    b. Installed heights and operating heights equal.
    c. Ratio of spring diameter divided by compressed spring height no less than 0.8.
    d. Springs have minimum additional travel to solid equal to 50 percent of rated deflection.
    e. Include spring diameters, deflection, compressed spring height and solid spring height in Submittals specified in Part 1 above.
    f. Basis-of-Design Product: Mason Industries, Inc.; Type SLF.

E. Hangers

1. Neoprene Hangers: Rigid steel frames containing neoprene element.

    a. Minimum 1-1/4-inch thick neoprene element on bottom with projecting bushing preventing steel-to-steel contact.
    b. Minimum static deflection of 0.20-inch.
    c. Boxes not articulated, clearance hole in neoprene element to allow non-moment bearing connection at structural support.
    d. Configured for threaded rod, eye bolt, or strap connections as required.
    e. Basis-of-Design Product: Mason Industries, Inc.; Type HD.

2. Type A Hangers: Rigid steel frames containing minimum 1-1/4-inch thick neoprene elements at top and steel spring with general characteristics as specified for Spring Isolator above seated in steel washer reinforced neoprene cup on bottom.

    a. Neoprene element and cup have neoprene bushings projecting through steel box.
    b. Boxes not articulated as clevis hangers nor neoprene element stacked on top of spring in order to maintain stability.
    c. Spring diameters and hanger box lower hole sizes large enough to permit hanger rod to swing through 30-degree arc from side-to-side before contacting cup bushing and short-circuiting spring.
    d. Include hanger drawing showing 30-degree capability.
    e. Basis-of-Design Product: Mason Industries, Inc.; Type 30N.

3. Type B Hangers: Similar to Type A Hangers specified above with following modifications.

    a. Pre-compressed and locked at rated deflection by means of resilient up-stop to keep piping or equipment at fixed elevation during installation.
    b. Designed with release mechanism to free spring after installation is complete and hanger subjected to full load.
    c. Deflection clearly indicated by means of scale.
    d. Include drawing of hanger showing 30-degree capability in Submittals required in Part 1 above.
    e. Basis-of-Design Product: Mason Industries, Inc.; Type PC30N.

4. Vibration Hangers: Similar to Type A Hangers specified above with following modifications.

    a. Provided with weldless eyebolts top and bottom to facilitate attachment to flat duct straps.
    b. Basis-of-Design Product: Mason Industries, Inc.; Type W30N.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and movement control devices for compliance with requirements for installation tolerances and other conditions affecting performance. Notify affected Prime Contractors and Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.

1. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

2. Identify any discrepancies between specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work required by discrepancies after installation at Contractor's expense.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 VIBRATION, SOUND, AND THERMAL MOVEMENT CONTROL INSTALLATIONS

A. Install all vibration isolators and acoustical attenuators in strict accordance with manufacturers written instructions and all submittal data. Coordinate installation to avoid rigid contact with building.

1. Install without any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

2. Do not make rigid connections between equipment and building structure that degrade noise and vibration control system specified.

3. Do not install any equipment, piping, duct, or conduit with rigid connections to building or other support structure unless no isolation is specifically called for. "Building" includes, but is not limited to, roof deck, floor/ceiling/roof slabs, beams, joists, columns, studs and walls.

    a. For exterior ground or frame mounted equipment

4. Identify any conflicts which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions to Architect / Engineer prior to installation. Corrective work required by conflicts after installation at Contractor's expense.

5. Correct, at no additional cost, all installations deemed defective in workmanship and materials at Contractor's expense.

3.3 PIPED EQUIPMENT INSTALLATIONS

A. Chillers, other Base Mounted Compressor-driven Equipment:

1. Isolate equipment from structure using vibration isolation system specifically designed for the installation and having deflection tuned to the mass and frequency of the rotating or vibrating machinery to minimize the propagation of the vibrations.

   a. Unless specifically detailed otherwise, isolate equipment having 1 KW motors and larger and/or having a rotating speed of any component under 1800 rpm using restrained spring isolators with minimum 2" deflection, on inverted saddles as required to lower height, all mounted on elastomeric pads.

   b. Unless specifically detailed otherwise, isolate equipment having under 1 KW motors and having a rotating speed of all components 1800 rpm or over using restrained elastomeric isolators with minimum 0.3" deflection, on inverted saddles as required to lower height.

   c. When installed indoors above occupied space, include floating concrete isolation base.

B. Hydronic Equipment

1. All base mounted pumps 1hp and larger installed above occupied spaces (including roof mounted pumps): Install on floating concrete isolation bases.

2. Vibration Isolation of Hydronic Equipment:

   a. Isolate all upper floor, suspended, and roof mounted hydronic equipment with vibration producing parts from structure using vibration isolation system specifically designed for the installation and having deflection tuned to the mass and frequency of the rotating or vibrating machinery so as to minimize the propagation of the vibrations.

   b. Where piping connects to mechanical equipment with vibration producing parts, including air-handling equipment with hydronic or refrigerant based heat exchange coils, install elastomeric spherical or mechanical coupling flexible connection joints.

      1) Where elastomeric based flexible connector joint is not suitable for service (example: refrigerant service), provide flexible stainless steel hose. Install hoses:

         a) On equipment side of shut-off valves.
         b) Parallel to rotating equipment shafts, wherever possible.
         c) Perpendicular to anticipated thermal movement.

d) Where movement in two axes is anticipated, install hose of sufficient length to form elbow or install two hoses with elbow fitting between.

C. Piping Installations:

1. Vibration and Acoustical Isolation of Piping: Locate isolation hangers as near to overhead support structure as possible.

a. Horizontal Pipe Isolation

1) Provide Type B hangers and/or restrained mountings for first 2 pipe hangers in lines near chillers, heat exchangers, pumps, and risers.

a) Provide restrained spring mountings for similar floor supported piping.
b) Provide same static deflection as specified for mountings under connected equipment, minimum 1 inch near chillers and pumps.

3.4 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust active height of spring isolators.

C. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 23 05 43

SECTION 23 05 48 – MECHANICAL [SEISMIC][AND][WIND]LOAD CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control of mechanical component movement resulting from seismic or wind generated loads. Controls for all mechanical equipment and components, piping, and duct work provided or modified as a part of this Project and as noted on the drawings are included.

B. Considering that the basis of design equipment is not always provided for project work, and that not all acceptable “equals” are the same weight, size, center of mass, cross section profile, and other characteristics that affect the seismic and wind load calculations, these detailed calculations are to be performed once specific to the approved mechanical equipment as part of a delegated design as detailed below.

C. Control of mechanically generated vibrations and sounds and control relative movement of components due to thermal expansion and contraction are covered in Section 23 05 43 – Mechanical Vibration and Movement Control.

1. Securing those vibration and movement control components against seismic and wind loads is covered in this section.

D. Specialized movement control components specified in this section include:

1. Seismic and wind restraints and snubbers.
2. Seismic and wind restraint construction requirements.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

D. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

E. OSHPD: Office of Statewide Health Planning and Development for the State of California.

F. Seismic Restraint: Engineered system including component attachment, building attachment, and all connecting hardware, designed to limit and control component movement during seismic event as required by design criteria.

1.4 SEISMIC RESTRAINT PERFORMANCE REQUIREMENTS

A. Provide restrained mechanical sound, vibration, and movement control for all mechanical equipment, piping, duct work, and other components provided or modified as a part of this Project, and as shown on the Drawings. Coordinate restraints with vibration and movement control system described in section 23 05 43 – Mechanical Vibration and Movement Control.

B. Provide complete design, detailing, and design documentation of all seismic restraints required and exceptions allowed, for all mechanical equipment, piping, duct work, and other components provided or modified as a part of this Project and as shown on the Drawings, allowing all restrained components to withstand seismic forces specified. Design shall be performed by a qualified licensed and registered professional engineer, with all drawings, calculations, and design analysis data signed and sealed by the engineer responsible for their preparation.

C. Design in accordance with the mechanical component seismic design requirements of the Building Code of New York State and applicable local codes. Calculations and design to be based on the following criteria.

D. Wind-Restraint Loading: Refer to Structural Load Notes on drawings.

A. Seismic-Restraint Loading: Refer to Structural Load Notes on drawings.

B. All points of termination/attachment to the building structure (including attachment to walls, decks and slabs) for the mechanical seismic restraints are subject to the review and approval of the Architect. Attachment to the top of steel beams and/or steel joists is the preferred point of attachment, with all beam and joist transverse loading required to be transmitted to the top deck shear plane. Modify mechanical seismic restraint details as required for attachment approval by the Architect (these modifications are to be performed at no additional cost to the Owner).

C. Applicable references to acceptable installation practices include:

1. SMACNA: Seismic Restraint Manual - Guidelines for Mechanical Systems.
2. ASHRAE: A Practical Guide to Seismic Restraint.
3. Mason Industries, Inc.: Seismic Restraint Guidelines.
4. FEMA: Installing Seismic restraints for Mechanical Equipment

1.5 SUBMITTALS

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

B. Action Submittals:

1. Product Data for the following:

a. Catalog cuts and data sheets on seismic-restraint components used. Indicate style, material, rated strength in tension and shear, fastening provision, and finish for each device.

b. Schedule of flexibly mounted equipment, referencing drawings by number. Include number, type, and loading of all isolation components.

2. Shop Drawings

a. Submit details of following items

1) Seismic restraints and anchors; refer to "Seismic Restraint Submittals" paragraph below.

b. Indicate deflections and model numbers on all hanger, mounting or pad drawings including any other specified requirements.

c. Provide in tabular form spring diameters, rated loads and deflections, heights at rated load and closed height for all springs shown in submittals.

3. Seismic Restraint Delegated-Design Submittal:

a. Seismic Restraint Shop Drawings: Each drawing and each bound set of calculations and design analysis sheets shall be signed and sealed by the qualified professional engineer responsible for their preparation.

1) Coordination Drawings: May be full size drawings. Submit plans and sections drawn to scale, showing all mechanical components with Seismic Restraint locations required, cross referencing types and sizes on Detailed Fabrication and Attachment Drawings. Show other systems and equipment, including their seismic restraints, in the vicinity, as this might affect the mechanical system's restraint. Coordinate seismic restraints with vibration isolation and expansion compensation systems. Include all mechanical systems seismic restraints on these coordination drawings.

2) Detailed Fabrication and Attachment Drawings: May be full size drawings. Include cross reference keys to details of Seismic Restraint systems for all designated sizes and types. Detail all mechanical vibration isolation and seismic-restraint systems construction and installation criteria as required to demonstrate compliance with project Seismic Restraint Requirements and design criteria. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

3) Pre-approval and Evaluation Documentation: UL Listed and/or OSHPD approved systems with details showing maximum ratings of restraint items and the basis for approval (tests or calculations).

4) Submit an Installation Quality Control Procedure. This must contain all required fastener torque values as well as any other critical installation procedures required to maintain the design integrity of the seismic system.

5) Calculations and Design Analysis: 8½"x11" format. Detail all pertinent calculations and data as required to assign applicable loads to each size and type of restraint, cross referencing types and sizes on Detailed Fabrication and Attachment Drawings.

6) Loading Design Calculations: 8½"x11" format. Provide detailed calculations for static and dynamic loading due to component weight and operation, seismic and wind forces required to select vibration isolators, seismic and wind restraints, and for designing vibration isolation bases.

a) Coordinate seismic-restraint and vibration isolation design with wind load calculations and wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Division 23 Sections for equipment mounted outdoors

b) Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure and mechanical components, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.

c) Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

C. Informational Submittals:

1. Product Certificates:

a. Submit certificates signed by manufacturers of seismic restraints certifying that products furnished comply with requirements. Provide test reports, from a qualified Independent Testing Agency indicating and interpreting test results of seismic control devices for compliance with requirements indicated and as required by the applicable code.

b. Provide certification from mechanical equipment manufacturer(s) per the requirements of the applicable code noted in "Seismic Restraint Requirements" paragraph above.

c. Submit schedule of seismically restrained equipment, including types and sizes of seismic restraints, complete with report numbers and rated strength in combined tension and shear.

d. Contractor Statement of Responsibility: Refer to Division 01 Section, “Quality Requirements”.

2. Welding certificates.

3. Qualification Data for testing agency.

4. Qualification Data for Professional Engineer: Document evidence of current New York State Professional Engineering Registration and provide references to three successful seismic restraint design projects of comparable or greater scope to this project within the past three years.

D. Closeout Submittals:

1. Field quality-control test reports.

2. Contract Closeout Submittals: Comply with requirements of Section 01 73 00, including submission of operating and maintenance instructions as item in "General Construction Instructions" manual described in that section.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent Testing Agency, with the experience and capability to conduct the testing and inspecting indicated as documented according to ASTM E 329, that is either a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, or accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), and that is acceptable to authorities having jurisdiction.

B. Professional Engineer Qualifications: Professional engineer legally qualified to practice in the jurisdiction where the Project is located and experienced in providing engineering services of the kind indicated, including (but not limited to) design and installation of vibration isolation bases and seismic restraints similar in material and extent to those indicated for this Project.

1. Document evidence of current New York State Professional Engineering Registration.

2. Provide detailed references of three successfully completed seismic restraint design projects within the past three years which had comparable or greater scope to this project: include scope description, budget, and contact information.

C. Comply with the more stringent of the seismic-restraint requirements in the Building and Mechanical Codes of New York State, International Building Code, Local Codes and Ordinances, the Authority having jurisdiction, or the requirements in this Section.

D. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

E. Pre-approved Seismic Restraints shall have horizontal and vertical load testing and analysis and shall bear anchorage pre-approval OPA number from OSHPD, or pre-approval by ICC-ES or Underwriters Laboratories, showing maximum seismic-restraint ratings. Pre-approved Ratings shall be based on independent testing.

1. If pre-approved seismic restraints are not used, submittals based on independent testing (preferred) and calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

1.7 COORDINATION

A. Coordinate layout and installation of wind load control and seismic restraint devices with other construction that penetrates ceilings or is supported by, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate size and location of concrete housekeeping pads and vibration isolation bases. Cast anchor-bolt inserts into base. Refer to applicable technical sections in Division 03 for concrete, reinforcement, and formwork requirements**.** Provide proper dowels in structural slab for housekeeping pads as required to meet seismic criteria. Submit housekeeping pad attachment details for approval, accompanied by a Design Data submittal stamped by a Professional Engineer licensed in the State that the Project is located, in accordance with "Quality Control Submittals" subparagraph in "Seismic Restraint Submittals" paragraph in "Submittals" article above.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

D. Coordinate design of restraints and vibration isolation design with expansion compensation systems.

E. Coordinate and design all attachments with building structural system, per the requirements in "Seismic Restraint Requirements" paragraph in "System Description" article above.

PART 2 - PRODUCTS

2.1 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amber/Booth Company, Inc.
2. Kinetics Noise Control.
3. Loos & Co.; Cableware Division.
4. Mason Industries Inc.

B. General Requirements for Restraint Components:

1. Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES, OSHPD, or UL.

2. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

3. Where neoprene is referred to and used in seismic restraint components, it shall be bridge-bearing grade premium neoprene of the durometer hardness grade and size specifically recommended by the design make manufacturer for proper restraint and load rating, and maximum vibration isolation for the specific application.

C. Factory Finishes: Provide manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanized metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation [and seismic- and wind-control] devices to indicate capacity range.

D. Manufactured Seismic Snubbers Type II: All-directional, double-acting snubbers consisting of interlocking steel members restrained by a 3/4-inch-thick minimum, replaceable, shock-absorbing neoprene insert and maintaining 1/8-inch minimum, 1/4-inch maximum clearance in all directions between rigid and resilient surfaces.

1. OSHPD Anchorage pre-approval “R” number.

E. Fabricated Seismic Snubbers Type III: Welded structural-steel shapes, conforming to ASTM A 36, designed and fabricated to resist gravity forces and restrain equipment or vibration isolation bases from excessive movement during a seismic event, consisting of interlocking steel members restrained by a 3/4-inch- thick minimum, replaceable, shock-absorbing neoprene insert and maintaining 1/8-inch minimum, 1/4-inch maximum clearance in all directions between rigid and resilient surfaces. Refer to the ASHRAE publication “A Practical Guide to Seismic Restraints” for available designs.

F. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

G. Cable Restraints: UL listed or OSHPD approved assembly consisting of pre-stretched ASTM A 603 galvanized (ASTM A 492 stainless for exterior) steel aircraft cable and end-fastening devices field bolted to equipment and building structure. All parts of the system including cables, end fastening devices, and installation requirements shall be provided by a single vendor as a system designed to assure seismic compliance.

1. Basis-of-Design Product: Amber/Booth (Loos and Co.); Type LRC.

H. Hanger Rod Stiffener: Steel tube, steel slotted-support-system sleeve with internally bolted connections, or reinforcing steel angle clamped to hanger rod.

I. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

J. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

K. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

L. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

M. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.2 WIND LOAD RESTRAINT DEVICES

A. Wind load restraint devices may include all seismic restraint devices listed above as approved and as included in the delegated design seismic restraint calculations submittal, as well as any other custom wind restraint devices designed and approved by delegated design engineer which are required above and beyond specified seismic restraint system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic restraint [**and wind control**]devices for compliance with requirements for installation tolerances and other conditions affecting performance. Notify affected Prime Contractors and Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.

1. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

2. Identify any discrepancies between specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work required by discrepancies after installation at Contractor's expense.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 SEISMIC RESTRAINT INSTALLATIONS

A. General Seismic Restraint Requirements:

1. Provide complete seismic restraint system as specified and as shown and detailed on approved delegated design submittals.

2. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

3. Install seismic restraint devices in strict accordance with the approved Installation Quality Control Procedure and other applicable submittal data, using methods approved by an evaluation service member of ICC-ES, OSHPD, or required submittals for component.

4. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

5. Install cables so they do not bend across edges of adjacent equipment or building structure.

6. Indicate on submittal drawings, by details, schedules, or a combination of both, the locations where hanger rods require hanger rod stiffeners. Install hanger rod stiffeners where indicated and as required to prevent buckling of hanger rods due to seismic forces.

B. Equipment Restraints:

1. Snubbers: Install the required number of seismic snubbers on each spring-mounted piece of equipment. Locate snubbers as close as possible to the vibration isolators and bolt to equipment base and supporting structure.

2. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolts and mounting hole in concrete base.

3. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

4. Vibration Isolation Bases: Mount equipment on structural-steel bases or concrete inertia bases.

C. Piping Restraint:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c., or closer as detailed in delegated design.
3. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application.
4. Brace at change of direction longer than 12 feet.

D. Structural Attachments:

1. All welding shall be by qualified welders using qualified procedures.

2. If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

3. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

4. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

5. Wedge Anchors: Protect threads from damage during anchor installation. Install heavy-duty sleeve anchors with sleeve fully engaged in the structural element to which anchor is to be fastened.

6. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

7. Set anchors to manufacturer's recommended torque, using a torque wrench.

8. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Accommodation of Differential Seismic Motion: Make flexible connections in piping and ductwork where they cross expansion and seismic control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at equipment. Design the system to accommodate the design displacements, and provide a signed and sealed Seismic Restraint Delegated Design Data Submittal attesting to this. Systems can be designed by one of the following methods:

1. Design systems to have the inherent flexibility required to accept the differential motion using pipe loops and/or offsets.
2. Localize the area at which differential motion will occur by anchoring to each building and provide a set of flexible connectors arranged to accept the motion.

B. Flexible Connectors:

1. Basis-of-Design Product: Southeastern Hose, Inc.; Model Seismijoint.

3.4 WIND RESTRAINT INSTALLATIONS

A. General Wind Restraint Requirements:

1. Provide complete wind restraint system as specified and as shown and detailed on approved delegated design submittals.

2. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

3. Install restraint devices in strict accordance with the approved Installation Quality Control Procedure and other applicable submittal data, using methods approved by an evaluation service member of ICC-ES, OSHPD, or required submittals for component.

4. Strength of Support and Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and wind loads within specified loading limits.

5. Install cables so they do not bend across edges of adjacent equipment or building structure.

B. Equipment Restraints:

1. Snubbers: Install the required number of snubbers on each spring-mounted piece of equipment. Locate snubbers as close as possible to the vibration isolators and bolt to equipment base and supporting structure.

2. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolts and mounting hole in concrete base.

3. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

4. Vibration Isolation Bases: Mount equipment on structural-steel bases or concrete inertia bases.

C. Piping Restraint:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c., or closer as detailed in delegated design.
3. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application.
4. Brace at change of direction longer than 12 feet.

D. Structural Attachments:

1. All welding shall be by qualified welders using qualified procedures.

2. If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

3. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

4. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

5. Wedge Anchors: Protect threads from damage during anchor installation. Install heavy-duty sleeve anchors with sleeve fully engaged in the structural element to which anchor is to be fastened.

6. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

7. Set anchors to manufacturer's recommended torque, using a torque wrench.

8. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust air-spring leveling mechanism.

D. Adjust active height of spring isolators.

E. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.6 FIELD QUALITY CONTROL

A. Contractor Requirements:

1. Testing Agency: Engage the services of a qualified Testing Agency to perform Tests and Inspections.

2. Provide access to all places of inspection for representatives Testing Agency(s).

3. Schedule tests with Owner’s Project Representative, and Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.

4. Obtain Architect's approval before transmitting test loads to the structure. Provide temporary load-spreading members as required by the test loads.

5. Perform the following Tests and Inspections:

   a. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
   b. Test at least four of each type and size of installed anchors and fasteners selected by Architect.

c. Test to 90 percent of rated proof load of device.
d. Measure isolator restraint clearance.
e. Measure isolator deflection.
f. Verify snubber minimum clearances.
g. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.
h. Prepare test reports and distribute to Owner and Architect.

6. Remove and replace malfunctioning units and retest as specified above.

B. Remove and replace malfunctioning units and retest as specified above.

C. Walk-through with Owner's Project Representative, Professional Engineer responsible for design of seismic restraints, and Restraint Manufacturer's Representative to verify installation is in accordance with specifications and submittals**.** Provide manufacturer approval letter and Professional Engineer-stamped letter documenting installation is complete and approved by them as in compliance with Project requirements.

D. Owner's Testing Agency: Will perform inspections and tests as required by applicable codes and insurance regulations. Make any corrections as required to meet Owner's Testing Agency's requirements.

END OF SECTION 23 05 48

SECTION 23 05 53 - IDENTIFICATION FOR HVAC COMPONENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Valve tags.

1.3 SUBMITTALS

A. Procedural Requirements: Comply with requirements of Section 01 33 00 - Submittals and as modified below.

1. Specified Products: If product to be incorporated into Project is specified by name and product designation in Part 2 below, submit "**As-Specified Verification Form**" (attached to Section 01 33 00 - Submittals) in lieu of "Product Data" identified below in this Article.

2. Equivalent Products or Substitutions: If product to be incorporated into Project is not specified by name and product designation in Part 2 below, comply with all Action Submittal requirements specified below.

B. Action submittals:

1. Submit manufacturer's data sheets for all proposed products demonstrating compliance with specifications.

C. Closeout Information, for inclusion in Operations and Maintenance Manual:

1. Approved submittal.

a. If "**As-Specified Verification Form**" submittal is approved, also include product data for all identification components used.

2. Include all information required in Section 01 78 23 – Operation and Maintenance Data.

3. Valve Chart - Refer to Section 23 05 00 – Common Work Results for HVAC, for details.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
B. Coordinate installation of identifying devices with locations of access panels and doors.
C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Paint: Refer to DIVISION 09.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brimar Industries, Inc. or equal.
2. Campbell International (Ltd.), or equal.
3. Craftmark Identification Systems, Fort Worth, Texas, or equal
4. EMED Company, Inc., Buffalo, New York , or equal
5. Seton Name Plate Company, New Haven, Connecticut, or equal

2.2 LABELS

A. Warning Signs and Equipment Labels:

1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware, or multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware

2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

3. Colors:

   a. Brass Labels: black in-filled letters on brass background
   b. Plastic Labels: white letters on black plastic background
   c. Warning Signs: yellow letters on black background.

4. Able to withstand temperatures up to 160 deg F . continuously.

5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

6. Fasteners: Stainless-steel rivets or self-tapping screws.

7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Equipment Label Content: Include equipment's Drawing designation or unique equipment number and equipment function.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to [**partially cover**] [**cover full**] circumference of pipe and to attach to pipe without fasteners or adhesive. Secure in place with full circumference tape wrap.

C. Pipe Label Contents: Include identification of piping service using abbreviations indicated below, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction (flow direction arrow circumference tape preferred).

2. Lettering Size: In accordance with ANSI 13.1 and as follows:

Outside diameter:		Letter Height:
a.	2” or less	¾”
b.	6” or less	1.25”
c.	10” or less	2.5”

3. Pipes too small to be directly labeled: provide hanging equipment tag with ½” lettering. Outside diameter indicated is to outside of pipe insulation on insulated piping.

D. Piping Systems: Identify the following systems as indicated:
1. Heating Hot Water Supply (HWS)
2. Heating Hot Water Return (HWR)
3. Natural Gas (G)
4. Chilled Water Supply (CHS)
5. Chilled Water Return (CHR)
6. Boiler Blow Down (BBD)

2.4 VALVE TAGS

A. Valve and Hydronic Specialty Identification: Provide 1-1/2-inch diameter brass tags, 0.032-inch minimum thickness, with predrilled or stamped holes for attachment with #16 brass jack chain, factory engraved or stamped with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with black in fill, legend as described below.

1. Stamp "H" and valve number for each main, riser, zone, and branch heating valve.
2. Stamp "C" and valve number for each main, riser, zone, and branch cooling valve.

3. Provide a special tag at thermal expansion tank(s) shut off valve with legend as follows: "Always keep this valve open except when draining tank".

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

B. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.
B. Locate equipment labels where accessible and visible.

3.3 PIPE IDENTIFICATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 15 feet along each run.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Piping Painting Requirements:

1. Refer to Section 23 05 00 – "Common Work Results for HVAC" and Division 09 sections covering painting for pipe painting requirements and Pipe Color Code Identification Schedule.

3.4 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
3. Near major equipment items and other points of origination and termination.
4. Spaced at maximum intervals of **15 feet** along each run.
5. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

	Item	Color
1.	Heating hot water…….....	Dark Red
2.	Natural gas……......	OSHA Safety Yellow
3.	Chilled water supply……	Blue
4.	Chemical treatment……..	White

3.5 VALVE-TAG INSTALLATION

A. Install tags on new valves, hydronic specialties, and control devices in piping systems. Verify existing valve numbers in field and provide valve numbering avoiding duplication of existing numbers.

B. Valve Identification Chart: Refer to Section 23 05 00 – "Common Work Results for HVAC" for Valve Identification Chart requirements.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Testing, Adjusting, and Balancing (TAB) Work shall be a joint effort of the Contractor and the TAB Agency, performed with the intention of leaving the systems involved in a properly functioning and balanced flow condition as designed and indicated in the Construction Documents, similar to the "Total System Balance" condition described in the AABC Standard.

1. The division of responsibility for the TAB Work is outlined below. Contractor to perform preparation and ancillary work described below, with the option of subcontracting a portion of their work to the TAB Agency, but the TAB Agency must take sole responsibility for any portion of the preparation or TAB Work defined as the TAB Agency's Work.

2. TAB Agency Work to be performed by a fully qualified independent TAB Agency as described in quality assurance below and as approved by the Architects and Engineers, to be paid for by the Contractor responsible for HVAC Work as a first tier subcontract to their work.

B. Section includes preparation for, and Testing, Adjusting, and Balancing (TAB Work) of HVAC components, equipment, and systems:

1. Contractor Preparation and Participation:

a. Place systems in satisfactory operating condition as detailed below prior to the arrival of the TAB Agency for the specified TAB Work, and notify the TAB agency, Construction Manager, and Engineer in writing when systems are ready for TAB Work.

b. Attend and actively participate in coordination and TAB meetings.

c. Keep TAB Agency apprised of construction schedule as required facilitating TAB agency job site visits prior to concealment of work. Provide overall construction schedule to TAB agency at coordination meetings and TAB meetings, update schedule regularly noting milestones and dates affecting TAB review and work schedule, and provide at minimum 7 calendar days notice prior to concealment.

d. Coordinate and provide mechanical and controls systems operation, revisions, and other ancillary work as required during TAB Work, as detailed below.

e. Make changes as required to create a testable, balanceable system, as recommended by TAB agency but only as approved by the Engineer.

2. TAB Agency Preparation:

a. Review Construction Documents and Coordination Drawings with Engineer, Construction Manager, and Contractor and assist in preparation of submittals, particularly Coordination Drawings, dampers, and balancing valves, by preparing recommendations to Contractor and Engineer on locations of balancing valves, dampers, access doors, test connections, etc., as well as any other special considerations affecting the TAB Work and/or the fabrication or engineering of the systems. Documentation of assistance shall be both by mutually agreed upon notations on the submittals / sheet metal Shop Drawings prior to submittal, and by TAB Agency's letter accompanying submittal, verifying review and TAB Agency approval of the specific submittal.

b. Visit job prior to concealment of work, repeatedly if necessary due to construction scheduling, check work, and advise the Contractor, Construction Manager, and Engineer on correctness of locations of dampers, access doors, test connections, etc., as well as any other special considerations affecting the TAB work. Advise in writing, copied to the Contractor, Construction Manager, and the Engineer within 3 days of the site visit but in any event before concealment.

C. TAB Work includes:

1. *Testing* of all mechanical components for performance, calibration, capacity, and other characteristics as outlined below and as required, demonstrating conformance with contract documents and submittals.

2. *Adjusting and Balancing* of all mechanical components of this project as described in the contract documents, achieving specified air and water flow at all terminal equipment, distribution at lowest noise levels and energy use, and achieving specified thermometer, gauge, and sensor instrument accuracy and calibration, all as outlined below.

3. Documentation, correspondence, data recording, reporting, and demonstration all as outlined below and elsewhere in the contract documents.

4. *Coordination* with other Contractors, subcontractors, Construction Manager, Owner's Representatives, and Architect / Engineer as required achieving specified TAB results.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.
B. ASHRAE: American Society of Heating, Refrigerating, and Air-Conditioning Engineers
C. Contractor: The entity contracted to perform the HVAC Work described in these contract documents.
D. NEBB: National Environmental Balancing Bureau.
E. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
F. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. TAB: Testing, adjusting, and balancing.
H. TABB: Testing, Adjusting, and Balancing Bureau.
I. TAB Agency: An entity engaged to perform TAB Work who is qualified and approved to do so as described below.

1.4 SUBMITTALS, GENERAL

A. Contractor:

1. Perform no work affecting TAB prior to TAB Agency approval and submission of Pre-Construction Inspection and Testing Report.

2. Prior to submittal of any equipment affecting TAB, review with approved TAB Agency and obtain commentary and approval as described in “Summary” Article. Include TAB Agency review commentary with affected submittals.

3. Immediately upon approval of other submittals, provide the TAB Agency with copies of approved submittals, including Shop Drawings of all hydronic and air systems and equipment requiring balancing.

1.5 ACTION SUBMITTALS

A. Contractor:

1. Within 30 days after award of Contract, submit TAB Agency qualifications proposal for approval.

B. Contractor and TAB Agency:

1. Submit Systems Readiness Reports as described more fully below.

C. TAB Agency:

1. Submit TAB Agency qualifications proposal for approval.

a. Name and contact information of proposed TAB Agency,

b. Documentation that they meet the qualifications specified in "Quality Assurance" Article, Evidence of current TAB Agency and TAB Supervisor Certification, Examples of data forms proposed for each system type showing input cells for this Project’s required data, 3 regional references for comparable recent jobs.

c. List of instruments to be used in testing and balancing, with current certification of all instruments’ calibration on calibration agency letterhead, including the following information:

1) Instrument type and make.
2) Serial number.
3) Application.
4) Dates of use.

5) Dates of calibration.
6) Test data points over range qualified – standards and measured values.

2. Submit Strategies and Procedures Plan: Within 30 days of Architect's approval of TAB Agency, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

3. Submit Preliminary Partial TAB Reports.

4. Submit Certified Final TAB Report.

5. Certified Six Month System Check / Design Condition TAB Report.

1.6 INFORMATIONAL SUBMITTAL

A. TAB Agency:

1. Contract Documents Examination Report: Within 15 days of Architect's approval of TAB Agency, submit the Contract Document Examination Report as specified in Part 3.
2. Include commentary with all Contractor submittals affecting TAB work as described above.
3. Pre-Construction Inspection and Testing Report: Prior to removal of any affected construction.

1.7 QUALITY ASSURANCE

A. TAB Agency, Employee, and TAB Work Qualifications:

1. TAB Agency: Fully certified current member of "Associated Air Balance Council" (AABC), "National Environmental Balancing Bureau" (NEBB), or "Testing, Adjusting, and Balancing Bureau" (TABB), specializing in the adjusting and balancing as specified in this Section of systems as specified and as shown on the Contract Documents, with minimum three years documented experience as a fully certified member, and three current regional references for projects of comparable scope.

2. TAB Field Supervisor: Employee of the TAB Agency and currently certified by AABC, NEBB, or TABB as a Testing, Balancing and Adjusting Supervisor.

3. TAB Technician: Employee of the TAB Agency and currently certified by AABC, NEBB, or TABB as a TAB technician.

4. All TAB Work: Performed by direct employees of the TAB Agency, who are either TAB Field Supervisors themselves, or who are TAB Technicians working under the direct supervision of a TAB Field Supervisor.

B. Conform to basic procedures and methods outlined by applicable publications in testing and balancing of air and water systems by the following organizations, and as modified by this document:

1. Associated Air Balance Council (AABC).

2. National Environmental Balancing Bureau (NEBB).
3. Testing, Adjusting, and Balancing Bureau (TABB).
4. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
5. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
6. Individual manufacturer requirements and recommendations.

C. TAB Conference: After approval of the TAB Strategies and Procedures Plan and before TAB Work begins, schedule and attend a meeting with Architect, Owner, and Construction Manager, at their convenience, to develop a mutual understanding of the details. Require the participation of the TAB Field Supervisor and Technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. Review the Contract Documents examination report.
b. Review the TAB Strategies and Procedures Plan.
c. Review the System Readiness Report.
d. Coordination and cooperation of trades and subcontractors.
e. Coordination of documentation and communication flow.

D. TAB Report Data Forms: Follow AABC, NEBB, TABB, or SMACNA format as modified by the data requirements of this Project, subject to submittal approval.

E. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

F. Instrumentation Type, Quantity, Accuracy, and Calibration: Instruments as described in ASHRAE 111, Section 5, "Instrumentation.", all currently certified as calibrated by a NRTL or NVLAP in accordance with Division 01 Section “Quality Requirements”.

G. Contractor: maintain qualified personnel at Project for system operation, trouble-shooting, making system changes, and performing mechanical adjustments in conjunction with TAB procedures.

1.8 PROJECT CONDITIONS

A. Environmental Requirements: Accomplish TAB work under appropriate outdoor temperature conditions. Coordinate with Temperature Controls Contractor to manipulate HVAC systems as required to simulate design conditions for load testing boilers, chillers, terminal load equipment, and similar portions of the systems.

B. Concealed Conditions: Before concealment of systems, verify and advise on type and location of balancing devices and test points. Make changes as required to balancing facilities.

1.9 COORDINATION AND SCHEDULING

A. Refer to Division 00 and Division 01 for overall project sequencing and scheduling requirements. All HVAC work required for, and, approvable balancing in accordance with the requirements of this section is required to be complete before Contract Substantial Completion.

1. Contractor:

a. Assure that all HVAC work required to properly and completely test and balance the various systems, occurs in a timely fashion coordinated with the overall project schedule as required, with final readiness report delivered at minimum two calendar weeks prior to contract scheduled Substantial Completion Dates.

b. For HVAC Work required to be performed simultaneous with TAB Work, coordinate schedule with TAB agency and provide qualified staffing as required keeping pace with TAB agency personnel.

c. For phased projects prepare phased partial readiness for TAB coordinated with TAB Agency as required meeting the Owner's construction schedule.

d. Coordinate and report partial systems readiness in writing to TAB agency, Construction Manager, and Engineer, to allow TAB work to proceed in an orderly fashion.

2. TAB Agency:

a. Assure that all TAB Work and all subsequent reporting on same occurs in a timely fashion coordinated with the overall project schedule prior to contract scheduled Substantial Completion Dates.

b. For HVAC Work required to be performed simultaneous with TAB Work, coordinate schedule with Contractor and provide qualified staffing as required to complete TAB work and reporting within one calendar week of partial phased work readiness and within two calendar weeks of final HVAC systems readiness for TAB.

B. Tab Agency: Coordinate, schedule, and run a TAB Strategies and Procedures meeting, with Contractor, Owner, Architect, Engineer, Controls Subcontractor, and Commissioning Agent all present. Provide TAB Plan and agenda in advance, and produce and distribute meeting minutes.

C. Contractor and TAB Agency: Perform all examination and preparation work required and submit Systems Readiness Report(s) prior to beginning TAB work.

D. Contractor and TAB Agency: After submission of Systems Readiness Report, coordinate and schedule all preparation and TAB work with each other, Owner, Architect/Engineer, Construction Manager, and Commissioning Agent.. Notify O/AE/CM/Cx team of all scheduled TAB work test dates and times in writing with at least seven days' advance notice for each visit.

1. Cooperate with other contractors and affected subcontractors as required to provide complete and proper testing, adjusting, and balancing of HVAC systems.

E. Accomplish TAB Work during construction period as soon as the systems are complete enough to perform TAB work. Coordinate with project phases and before Owner takes possession. TAB work and approval of at least partial pencil copy reports is required before Owner takes possession.

F. Multiple visits will be required for phased construction in cooperation with construction schedule, with multiple "pencil copy" submittals of partial TAB reports required promptly as each phase of TAB work is accomplished.

G. Perform balancing for record at final stage when all previously completed sub-systems are checked and re-balanced to design performance.

H. Contractor and TAB Agency: return to the site approximately six months after initial TAB Work is complete to perform system checkup and design condition rebalancing as defined below.

I. Contractor and TAB Agency are subject to recall to site to verify report information before acceptance of the report by the Architect.

J. Contractor: provide 2 additional copies of Shop Drawings and other submittals for all equipment and systems to be tested and balanced to TAB Agency as soon as possible but no later than 60 days prior to scheduled completion of equipment and systems installation.

K. TAB Agency:

1. Verify that Contractor has placed all systems and equipment in satisfactory operating condition as required allowing TAB Work to be properly performed.

2. Cooperate with Contractor and affected subcontractors as required to provide complete and proper testing, adjusting, and balancing of air and water systems.

3. Visit Project prior to concealment of Work and note location of dampers, test connections, and similar items. Record this information, transmit to Contractor, and incorporate on Record Drawings.

4. Coordinate timing of six month system check and design condition TAB Work with weather, Contractor, and Owner.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. TAB Agency: Provide tools, ladders, recording meters, gauges, thermometers, velometers, anemometers, Pitot tubes, inclined gauge manometers, magnehelic gauges, amprobes, voltmeters, psychrometers, tachometers, ultrasonic or other non-intrusive flowmeters, sound meters, and all other instrumentation required to perform specified TAB work. Accurately calibrate all instruments.

1. Make instruments available to Architect to facilitate spot checks during testing and back-checking.

2. Provide additional balancing devices as required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. By TAB Agency:

1. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

2. Visit Site and examine existing systems before construction and new / re-worked systems prior to concealment of construction to check on and advise regarding location of installed balancing devices, such as test ports, gage cocks, thermometer wells, thermometers and gages, flow-control devices, balancing valves and fittings, volume dampers, test connections, etc. Verify that locations of these balancing devices are accessible. TAB Agency shall advise Contractor and Architect of TAB Agency findings by letter.

3. Examine the submittals for HVAC systems and equipment. Verify that proposed equipment can be balanced as specified and as required. Provide commentary on all submittals advising where additional balancing devices are needed or configuration adjustment is desired to facilitate TAB work.

4. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

5. Examine test reports specified in individual system and equipment Sections.

6. Examine manufacturer’s equipment performance data including pump and fan curves.

    a. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

B. By Contractor:

1. Examine systems and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections has been performed, and all TAB preparation as described in “Preparation” Article is complete.

3.2 PREPARATION

A. TAB Agency:

1. Prepare and submit a TAB plan that includes the following

a. Site specific strategies narrative and step-by-step procedures with this project's equipment identified.
b. Instrumentation to be used.
c. Forms with specific identification for all equipment.

2. Prepare and submit a blank master Systems Readiness Report to Engineer, Commissioning Agent, and Contractors, with itemized checklists for each individual item to receive TAB Work as appropriate for the equipment, with a column for Contractor indicated status and another two columns with room for TAB Agency and Commissioning Agency commentary itemizing deficiencies discovered and confirming all systems preparation and examination has been properly performed. Include, at minimum, the following checks for each piece of equipment as applicable:

   a. Hydronic and piping side:

      1) Verify leakage and pressure/vacuum tests on distribution systems have been satisfactorily completed.
      2) Piping is complete with terminals installed.
      3) Water treatment is complete, and systems are flushed, filled, purged, and vented.
      4) Refrigerant systems are properly evacuated and filled with the correct refrigerant at the right pressure.
      5) Strainers are all clean.
      6) Manufacturer's startup checklists have been appended.
      7) Shutoff and balance valves have been verified to be 100 percent open.
      8) Pumps are started and proper rotation is verified.
      9) Pressure gauges, thermometers, and PT plugs are all installed where and as specified.
      10) Suitable access to balancing devices and equipment is provided.

   b. Energy Management and Controls System:

      1) Pressure, temperature, position, electrical current, and other controls system sensors are installed where and as specified.
      2) Control valves, dampers, and variable-frequency controllers' are functioning in accordance with the sequence of operation.
      3) Controllers are installed and functioning in accordance with the sequence of operation.

B. Contractor: Before TAB work commences on any portion of the system, and before new system startup, verify that systems are complete and in proper operating condition. Ensure the following:

   1. Equipment is operable, in a safe and normal condition, and is of the size and capacity specified in the Contract Documents, bearings are greased, pulleys are aligned and belts properly tight, and equipment with functioning controls is ready for operation. Make any required modifications to systems in advance of the TAB Agency's arrival for that portion of the work.

   2. Provide proper equipment start-up as specified, complete with manufacturer's filled out standard published start-up forms.

3. Temperature control systems are operable to the extent required for that portion of the TAB Work. Control valves must at least be installed complete and hand operable. Automatic dampers must be operable and under control. Safety interlocks and controls on HVAC equipment must be properly functional.

4. All motors, pumps, and fans have correct rotation.

5. Permanent electrical-power wiring is complete, and proper thermal overload protection is in place for all electrical equipment.

6. All piping, boilers, chillers, pumps, valves, required pressure taps, and hydronic specialties are correctly installed, complete, operational, and clean.

7. Hydronic systems have all required vents and drains installed and functional, and are flushed, vented, cleaned, leak free, and filled with specified heat transfer fluid.

8. Hydronic expansion tank has been pre-charged to the proper pressure and systems filled to proper cold fill pressure.

9. System pump suction piping is properly vented to ensure absence of entrained air.

10. All hydronic systems valves are installed with proper direction of flow and operate smoothly, balancing valves are adjusted open, P-T plugs and gauges are installed and functional where required, two-way control valves are open, three-way valves are properly installed for their intended function of diverting or mixing fluid flows, and service valves are open or closed as required for normal flow.

11. Make preliminary adjustments to airflow patterns of all registers, grilles, and diffusers to obtain uniform space temperatures and air movement free from objectionable drafts and noise.

12. Clean new final design filters are installed everywhere called for.

13. Hydronic strainers are clean and any temporary screens are replaced with permanent screens. Sidestream filters have clean new filter bag installed and valves are closed.

14. As-built conditions are accurately recorded on working as-built drawings, including locations of all access points, manual and automatic dampers, isolation, balancing, and control valves, fittings, and all other items affecting TAB work. Provide copies of these annotated as-built drawings for TAB agency's use during TAB work.

15. As the various portions of the system are completed and become ready for TAB, prepare and submit partial Systems Readiness Reports to Engineer, Commissioning Agent, and TAB Agency, with itemized checklists filled out as appropriate for the equipment to receive TAB Work, indicating status and requesting TAB for that portion of work commence.

    a. Include itemized list of all examination and preparation procedures outlined above and as otherwise required by TAB and Commissioning Agencies' procedures, with initialed dated verification of each item by authorized responsible party.

b. Promptly report abnormal conditions in mechanical systems or conditions that prevent system balance. If, for any reason, system cannot be properly balanced, report as soon as observed.

16. Report any additional defects or deficiencies observed during performance of TAB procedures.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. In the following TAB procedures portions of Part 3 Execution of this document, the procedures are deemed to be TAB Agency work unless specifically identified as Contractor work.

B. Contractor required assistance and Ancillary Work during TAB Agency Work includes the following general work categories and notes on Contractor Work requirements in subsequent specific procedure descriptions:

1. Maintain mechanically qualified personnel at Site to perform necessary mechanical modifications and adjustments in conjunction with TAB procedures.

2. Operate systems.

3. Provide trouble-shooting.

4. Cut insulation, pipes, ducts, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures. Properly plug all holes. Provide new insulation that matches removed materials, finished in accordance with Division 23 Section "HVAC Insulation."

5. Adjust automatic damper linkages so they all operate smoothly and close tightly.

6. Perform necessary controls operations required for TAB procedures.

7. Make any required additions or changes in types, locations, etc., of balancing equipment.

8. Provide other mechanical adjustments as required in conjunction with TAB procedures.

C. Tab Agency: Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing", and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2, "Air Balancing."

2. Review, edit, and deliver annotated Contractors Systems Readiness Reports to Contractor, Engineer, and Commissioning Agent, with itemized TAB Agency concurrence or commentary, itemizing deficiencies discovered and confirming all systems preparation and examination has been properly performed, with initialed dated verification of each item by authorized responsible party.

3. Provide all testing and Balancing as required by the specific procedures outlined below and as required to provide the final test report as described below.

4. Mark equipment and balancing devices, valve position indicators, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

5. Take and report testing and balancing measurements in inch-pound (IP) units unless otherwise directed.

6. Promptly report abnormal conditions in mechanical systems or conditions that prevent system balance, for any reason including but not limited to installation, design, or Owner use reasons within 24 hours of discovery.

7. Report any defects or deficiencies observed during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values. Include updates in partial TAB report submittals. Adjust as-built drawings as required to accurately reflect deviations from draft as-built set.

3.4 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Pre-Construction Testing of Existing HVAC Systems: Prior to system shut down, demolition and modifications associated with existing HVAC systems, and prior to submittal of any replacement equipment, provide testing and recording of existing system operating data as itemized below. Submit copies of existing system operating data to Architect for review. On completion of system modifications, confirm that new or modified system characteristics conform to original data or new requirements by taking new readings and readjusting systems as required.

B. On systems where there are no HVAC component modifications or work other than possible TAB work shown on the contract drawings, no TAB work is required unless specifically called for on the drawings.

C. On systems that are only partially modified, perform TAB work both before and after modifications as required to demonstrate that modified portions of the system are performing as required and unmodified portions of the system are still operating at least as well as they were prior to modifications. Also perform additional TAB work as specifically called for on the drawings.

D. Perform the following operations:

1. Hydronic systems:

a. Pumps: Check and record make and model; suction, discharge, and impeller size; pump discharge, suction and total head pressure; drive frequency if controlled by VFD, and gallons per minute delivery.

b. Balancing fittings: Check and record pressure drop, flowrate, and operating condition.

c. Control valves: pressure drop at flow measured at associate balancing fitting.

3.5 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.

2. Check liquid level in expansion tank.

3. Check makeup water-station pressure gage for adequate pressure for highest vent.

4. Check flow-control valves for specified sequence of operation, and set at indicated flow.

5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.

6. Set system controls so automatic valves are wide open to heat exchangers.

7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.

8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.6 PROCEDURES FOR HYDRONIC SYSTEMS

A. Measure water flow at pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump at 60Hz/VSD bypass. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Architect and comply with requirements in Division 23 Section "Hydronic Pumps."

2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved and mark pump manufacturer's head-capacity curve with this initial balance point. Note and record pump discharge valve position, then

return to wide open (or maximum non-overloading position) for proportional balancing procedure.

a. Monitor motor performance during procedures and do not operate motors in overload conditions.

3. Verify pump-motor brake horsepower at intended flow rate at run-out. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.

4. Report flow rates that are not within plus or minus 10 percent of design.

B. Vary total system flowrate by adjustments at pump.

1. For constant speed single pump operation systems: throttle the system pump balancing/triple-duty valve until the flow in the system is the design flow rate. If the available flow from the pump is less than the design flow using this procedure, report this to the engineer for advisement immediately. Report the pump, valve, and motor data both with the throttling valve in the wide open and at the final, design flowrate position.

2. For variable frequency drive pumps, Perform the following procedure for each pump circuit running individually:

a. Ramp the VSD to the minimum frequency required to obtain the design flow, with each pump discharge valve open to the maximum position consistent with accurate reading and VSD bypass/60Hz non-overloading operation.

b. Repeat this VSD adjustment for each pump circuit of lead / lag pumps driven by one VSD, and set the VSD at the higher of these two frequencies.

c. At this frequency (the full design frequency - could be more or less than 60Hz), adjust the higher flow rate circuit to the design flow rate by further throttling the pump balancing valve, so that the flow rate from each pump is identical at the design frequency.

d. Verify that all terminal units are at the design gpm to within the balancing tolerance, and if not, repeat steps above until design conditions are satisfied at all system valves, with no excessive pressure and resultant energy use.

e. Report this value as the design frequency in the balancing report, and in writing to the Contractor responsible for incorporation into controls work of the Division 23 .

f. Measure and report the flow-rate at 60Hz, and also at the frequency where the pump motor is running at full load amperage.

g. Measure and report all other pump flow data at this point.

h. Check settings and operation of each safety valve. Record settings.

3.7 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the automatic and manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.8 PROCEDURES FOR WATER CHILLERS

A. Balance water flow through each heat exchanger (evaporator and condenser) to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. For water-cooled chillers, condenser-water entering and leaving temperatures, pressure drop, and water flow.
3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
4. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
6. Capacity: Calculate in tons of cooling.
7. For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.
8. Efficiency: Calculate operating efficiency for comparison to submitted equipment.

3.9 PROCEDURES FOR BOILERS

A. All Boilers:

1. Measure and record relief valve(s) pressure and setting.
2. Capacity: Calculate in Btu/h of heating output.
3. Fuel Consumption: If boiler fuel supply is equipped with flow meter, measure and record consumption.
4. Measure and record combustion air flow and temperature.
5. Measure and record flu gas temperature, flowrate, and combustion gas contents including % O_2, % CO_2, and ppm NO_X.
6. Efficiency: Calculate operating efficiency for comparison to submitted equipment.

7. Fan, motor, and motor controller operating data.

B. Hydronic Boilers:

1. Measure and record entering- and leaving-water temperatures and water flow.
2. Measure and record pressure drop.

3.10 SOUND TESTS

A. After systems are balanced and before Substantial Completion, measure and record sound levels at locations as designated by the Architect as having sound level performance requirements. Include at least the following systems:

1. Each Chiller.

2. Each boiler

3. Each Variable Frequency Drive, integral with the equipment it serves

3.11 TOLERANCES

A. Adjust system totals to the sum of the connected load (plus leakage for air systems) rather than the scheduled pump or fan capacity.

B. Adjust hydronic systems as follows:

1. Each pump to within 5 percent of the design flow values.

3.12 PRELIMINARY REPORTING

A. Contract Document Examination Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for proper systems' balancing. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Pre-Construction Inspection and Testing Report: Prior to removal of any affected construction, prepare and submit report outlining results of Pre-Construction Inspection and Testing as outlined above and on the contract drawings.

C. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.13 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.

2. Name and address of the TAB contractor.

3. Project name.

4. Project location.

5. Architect's name and address.

6. Engineer's name and address.

7. Contractor's name and address.

8. Report date.

9. Signature of TAB supervisor who certifies the report.

10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.

11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.

13. Data for terminal units, including manufacturer's name, type, size, and fittings.

14. Notes to explain why certain final data in the body of reports vary from indicated values.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
   1. Water flow rates.
   2. Pipe and valve sizes and locations.
   3. Position of balancing devices.

E. Chiller Test Reports:

   1. Test Data (Indicated and Actual Values):

      a. Water flow rate in gpm.
      b. Water pressure differential in feet of head or psig.
      c. Entering-water temperature in deg F.
      d. Leaving-water temperature in deg F.
      e. Refrigerant expansion valve and refrigerant types.
      f. Refrigerant suction pressure in psig.
      g. Refrigerant suction temperature in deg F.
      h. Sound Test Data.

F. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

   1. Unit Data:

      a. Unit identification.
      b. Location.
      c. Service.
      d. Make and size.
      e. Model number and serial number.
      f. Water flow rate in gpm.
      g. Water pressure differential in feet of head or psig.
      h. Required net positive suction head in feet of head or psig.
      i. Pump rpm.
      j. Design frequency for VSD pumps.
      k. Impeller diameter in inches.
      l. Motor make and frame size.
      m. Motor horsepower and rpm.
      n. Voltage at each connection.
      o. Starter size, rating, heater data.
      p. Amperage for each phase.
      q. Rated efficiency, full-load amperage, and service factor.
      r. Seal type.

   2. Test Data (Indicated and Actual Values):

      a. Static head in feet of head or psig.
      b. Pump shutoff pressure in feet of head or psig.
      c. Actual impeller size in inches.
      d. Full-open flow rate in gpm.
      e. Full-open pressure in feet of head or psig.
      f. Final discharge pressure in feet of head or psig.

g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

G. Electric Motors:

1. Manufacturer
2. HP/BHP
3. Phase, voltage, amperage (nameplate, actual, and no load)
4. RPM
5. Service factor
6. Starter size, rating, heater elements

H. Flow Measuring Station, Pump Discharge, and Balancing Valves:

1. Identification/station
2. Location
3. Size
4. Manufacturer
5. Model
6. Design flow rate
7. Design pressure drop
8. Actual/final pressure drop
9. Actual/final flow rate
10. Station calibrated setting

I. Hydronic Control Valves Reports:

1. Location
2. Manufacturer
3. Model
4. Flowrate, specified and actual.
5. Pressure drop at full flow condition.

J. Gauges and Thermometers Reports:

1. Identification/number
2. Location
3. Service
4. Manufacturer
5. Test all gauges and thermometers for mid range accuracy. Adjust thermometers where applicable; adjust all gauges for best 0 and/or midrange accuracy.
6. Temperature, test reading and actual
7. Pressure, test reading and actual

K. Controls Sensors Reports:

1. Coordinate work with Energy Management and Control System.

2. Verify that locations shown on Operators Work Station are schematically correct.

3. Identification/number

4. Location

5. Service

6. Manufacturer

7. Temperature, test reading and actual

8. Pressure, test reading and actual

9. **A**ir composition, parts per million, test reading and actual. Test and adjust at normal ambient and alarm conditions.

L. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.14 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

2. Check the following for each system:

a. Measure water flow of each device.
b. Verify that balancing devices are marked with final balance position.
c. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection by TAB Agency is complete and documentation verifies that testing and balancing are complete and accurately documented in the report, request that a final inspection be made, giving at minimum 7 calendar days' notice. Deliver copies of Draft Final Report to Engineer and Commissioning Authority with final inspection request.

a. Engineer may elect to postpone final inspection upon delivery of written notice to TAB Agency that significant portions of the required TAB results are missing

from draft report. If inspection is postponed, TAB Agency shall promptly return to site and provide missing TAB Work, then submit a revised draft and request the Final Inspection again.

2. The TAB Agency and Contractor's qualified technicians are to provide access, tools, and measurements during the inspection in the presence of the TAB Agency Supervisor and the Commissioning Authority.

3. Commissioning Authority will randomly select measurements, documented in the report or as required by contract, to be rechecked. Rechecking will be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED." If recheck calls for a measurement that is required but cannot be found in the draft report, the missing measurement will be noted as "MISSING".

5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the TAB Work will be considered defective and rejected. If the number of "MISSING" measurements is greater than 10 percent of the total measurements checked during the final inspection, the TAB Work will be considered defective and rejected.

C. If TAB Work is considered defective and rejected, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection. Pay all costs associated with second inspection including Commissioning Authority's reasonable additional fees.

2. If the second final inspection also fails, Owner may require additional inspection similar to second inspection or may contract the services of another TAB agency to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB Agency's final payment.

D. Prepare test and inspection reports.

END OF SECTION 23 05 93

SECTION 23 07 00 – HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and all Division 01 Sections, apply to this Section.

1.2 SUMMARY

A. Section includes materials and installation requirements for mechanical component insulation and related accessories.

1. Insulation Materials:

a. Calcium silicate.
b. Cellular glass.
c. Flexible elastomeric.
d. Mineral fiber.
e. Phenolic.
f. Polyisocyanurate.
g. Polyolefin.
h. Polystyrene.
i. Fire rated insulation systems

2. Insulation Accessories:

a. Insulating cements.
b. Adhesives.
c. Mastics.
d. Lagging adhesives.
e. Sealants.
f. Factory-applied jackets.
g. Field-applied fabric-reinforcing mesh.
h. Field-applied cloths.
i. Field-applied jackets.
j. Tapes.
k. Securements.
l. Corner angles.
m. Insulation protection systems

1.3 DEFINITIONS

A. “Concealed”: Work within or behind various construction elements, or in crawl spaces or trenches, that is not exposed to view when Project has been completed. (Areas above ceilings,

including above Auditorium or Large Group Instruction partially open “cloud” ceilings and chases are considered a concealed location.)

B. “Exposed”: Anything exposed to view when project has been completed.

1.4 SUBMITTALS

A. Comply with requirements of SECTION 01 33 00 – Submittal Procedures and as modified below.

B. Provide all submittals required by this Section concurrently.

C. Product Data

1. Submit complete manufacturer’s product information for each type of insulation and accessory specified in this section demonstrating compliance with specified requirements and including:

   a. Thermal and vapor transmission performance.
   b. MSDS information.
   c. Flame spread / smoke developed data.
   d. Manufacturer’s recommended installation methods.

D. Submit insulation schedule indicating each required service with type of insulation, thickness and R value, covering method, finishes, and any applicable notes.

E. Quality Control Submittals

1. Qualifications Certification: Submit written certification of installers signed by applicable certification agency and/or manufacturer (where applicable) indicating compliance with “Installer Qualifications” requirements specified below in “Quality Assurance” article.

2. Installer Experience Listing: Submit list of completed projects using products proposed for this Project, including Owner contact information for each project, demonstrating compliance with applicable “Qualifications” requirements specified below in “Quality Assurance” article.

F. Contract Closeout Submittals: Comply with requirements of DIVISION 1 sections on closeout, including submission of maintenance instructions as item in "Operating and Maintenance Data" manual described there.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Provide insulation system installation by qualified Installers who are trained in installation of each proposed insulation material and product with at least one of the following qualifications:

1. Have successfully completed a mechanical insulation apprenticeship program by the Department of Labor, Bureau of Apprenticeship and Training,

2. Have successfully completed an ASHRAE / NIA 8 hour Mechanical Insulation Training course or equal, or
3. Have five years documented experience as a mechanical insulation specialist with references attesting to successful completion of at least three comparable projects.

B. Condensation Resistance: Provide insulation and vapor barrier systems complete as required to eliminate condensation under any normal operating conditions from surfaces of all cooling equipment and components provided or modified as a part of this contract Work, unless those surfaces are designed to remove moisture by condensation from process air, and to contain and drain the condensate.

C. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Components."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate with installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.8 DELIVERY, STORAGE AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For convenience, details and specifications have been based on products by the following manufacturers:

1. Armstrong; Lancaster, Pennsylvania
2. Benjamin Foster
3. CertainTeed; Valley Forge, Pennsylvania
4. Fit Tight Covers, Inc.
5. Johns Manville; Defiance, Ohio
6. Kingspan Tarec
7. Knauf; North Carolina
8. No Sweat Valve Wraps, Inc.
9. Owens-Corning; Toledo, Ohio
10. Polyguard Products Inc., Ennis, Texas
11. Thermaxx, LLC.
12. Or Approved Equal.

2.2 MATERIALS

A. Pipe and Fitting Insulation: Provide pipe insulation in compliance with ASTM C 585 Dimensional Standards.

1. Insulation Thickness:

a. Pipe and fitting insulation thicknesses specified assume an insulation conductivity (k) value of 0.27 btu•in/hr•ft2•^{o}F. For pipe and fitting insulation with conductivity other than 0.27 btu•in/hr•ft2•^{o}F, insulation must be thicker for higher conductivity and may be thinner for lower conductivity as required to achieve same or higher R value. Adjust insulation thickness from that specified in accordance with the following formula:

T = r[(1+t/r)K/k-1] where:

1) T = Adjusted insulation thickness, inches
2) r = Actual pipe outside radius, inches.
3) t = Insulation thickness specified, inches.
4) K = actual insulation conductivity, btu•in/hr•ft2•^{o}F.
5) k = specified conductivity, 0.27 btu•in/hr•ft2•^{o}F.

b. Hydronic Piping for Cooling Only:
1) Pipe sizes 1inch through 6 inch ..... 1 inches
2) Pipe sizes 8 inch and larger ..... 1-½ inches

c. Hydronic Piping for Heating:

1) Pipe sizes ½ inch through 1-¼ inches..... 1-1/2 inch

2) Pipe sizes 1-½ inches and larger .....2 inches

2. Interior Above Grade Hydronic Piping Insulation:

a. ASTM C547, cylindrically molded preformed rigid half pipe shell forms, factory one-piece "hinged" construction.

1) Rigid pipe or tube insulation may be of mineral wool, fiberglass, closed cell glass, formed polyisocyanurate, formed phenolic, or extruded polystyrene (chilled service only).

2) Thermal Conductivity ("k"): Measured in accordance with ASTM C 335. For k values greater than 0.27, include calculations and compliant increased thickness proposed. For k values equal or less than 0.27, provide specified insulation thickness or calculations justifying thinner insulation.

3) Jacket: All Purpose (AP) vapor barrier jacket with:

a) White kraft paper outer surface bonded to aluminum foil, reinforced with fiberglass yarn, permanently treated for fire and smoke safety and to prevent corrosion of foil.
b) Self sealing pressure sensitive lap.
c) Water Vapor Permeance: ASTM E96, Procedure A, 0.02 perm maximum.
d) Puncture resistance: ASTM D781, 85 scale units minimum
e) Burst resistance: ASTM D774, 100psi minimum.
f) Similar to "150TL facing" as used in "AP T Plus Jacket" and tape by Johns Manville, or equal.

3. Exterior Above Grade Hydronic Piping Insulation:

a. ASTM C547, cylindrically molded preformed rigid half pipe shell forms, factory one-piece "hinged" construction.

1) Rigid pipe or tube insulation may be of closed cell glass, formed polyisocyanurate, formed phenolic, or extruded polystyrene (chilled service only).

2) Thermal Conductivity ("k"): Measured in accordance with ASTM C 335. For k values greater than 0.27, include calculations and compliant increased thickness proposed. For k values equal or less than 0.27, provide specified insulation thickness or calculations justifying thinner insulation.

3) Exterior Pipe Insulation Protective Jacket specified below.

4. Fitting and Valve Insulation: Precut fiberglass blanket to match thickness, appearance and insulation value of adjacent pipe insulation; similar to "Hi Lo Temp Fiber Glass Insulation Insert" by Johns Manville, with fitted protective jacket specified for the installation.

B. Pipe and Fitting Protective Jackets:

1. Intended for permanent installation on non-serviceable components only.

2. Interior Pipe and Fitting Insulation Protective Jacket:

   a. Plastic: High-impact, UV resistant polyvinyl chloride, white, paintable, covering designed to fit over AP jacketed insulated piping systems, molded to fit various sizes of fittings and piping as required; similar to "Zeston 2000 or Zeston 300 PVC Jacketing" by Johns Manville.

      1) 20 mil thickness: Fittings and valves in interior applications eight feet above finished floor and higher.
      2) 30 mil thickness: Fittings, valves, and straight pipe in interior applications lower than eight feet above finished floor.

   b. Aluminum: Circumferentially corrugated 20mil thick or embossed 24 mil thick, with approved moisture barrier, with matching preformed fitting covers by same manufacturer. Similar to Corrolon by Childers.

3. Exterior Pipe and Fitting Insulation Protective Jacket: Modified bituminous, aluminum skinned, peal and stick membrane, similar to Polyguard "Alumaguard 60", with the following properties:

   a. Minimum 60 mils thick
   b. Permeance less than 0.01 Perms
   c. Puncture resistance per ASTM E154 >40lbs.
   d. Overlap bond peal adhesion per ASTM D1000 never less than 11lb/in.
   e. UV stabilized.
   f. Self healing when punctured.

C. Valve Covers, Serviceable Hydronic Component Insulation Jackets:

1. 2" nominal size and smaller Strainers, Triple Duty, Autoflow Control, Manual Balancing, Check, Combination, and Control Valves, and other similar piping components needing periodic service, maintenance or adjustment - provide easily removable insulation jacket requiring no special tools for installation or removal / replacement:

   a. Factory fabricated removable and reusable cover similar to products by No Sweat Valve Wraps, Inc., or approved equal.

   b. Size so outer jacket overlaps adjoining sections of pipe insulation.

   c. Flame and smoke spread 25/50 per ASTM E-84 or less.

   d. Maximum k- factor .26 or matching surrounding insulation, using fiberglass blanket.

   e. Outer jacket made of material equal to DuPont Tychem® QC (polyethylene coated Tyvek) , overlapping and completely covering the insulation with seams joined by integral elastic banding and tabs made from hook and loop fasteners (Velcro).

f. Butt ends and stem penetrations have sewn-in-place elastic. On cooling service, provide PSA backed closed cell foam gasket material adhered to stem penetration or surrounding insulation jacket between substrate and elastic jacket closure, as required insuring a complete vapor seal.

2. Pumps, Suction Diffusers, Triple Duty Valves, Balancing and Control Valves over 2" nominal size, and other HVAC components needing periodic service, maintenance or adjustment - provide easily removable, reusable insulation jacket in one of two types:

   a. Fabric type insulation jacket similar to products by ThermaXX, LLC, Fit Tight Covers, or approved equal:

      1) Silicone impregnated fiberglass composite cloth jacketing, 17 oz/sq. yd. minimum, 5 lb/cf type E needled fiberglass mat insulation, 35 lb test Kevlar thread, fiberglass or nylon webbing, Velcro closures or high temperature FRP buckles.

      2) Constructed in a folded three-dimensional shape designed to minimize the air space and convection current in the space between the hot metal surface and the inner layer of insulation, seamed for removal and replacement inspection ease. Insulation sandwiched and protected between inner and outer layers of jacketing cloth.

      3) All jacket pieces which match mating seams must include an extended 2" flap constructed from the exterior fabric (or equivalent) secured using hook & loop closure (i.e. Velcro®) and SS D-rings parallel to the seam or quick release adjustable buckles. Hog rings, staples, wire, etc., are not acceptable methods of closure.

      4) Insulation sewn to inner and outer jackets to prevent shifting, in two layers minimum with staggered stitch lines between inside and outside jackets, of thickness as required to match R value of surrounding pipe insulation. All seams sewn with lock stitch at a minimum of 5 stitches per inch using specified thread. All seams except closing seam introverted, closing seam on inside: no raw cut jacket edges exposed after install.

      5) For below ambient services, provide vapor barrier coated exterior jacket, with seam sealant at all stitch lines. Seal between jacket and equipment with replaceable closed cell gasket material to form a vapor barrier.

      6) Provide a permanently attached Laser Etched Anodized Aluminum nameplate (2" x 3.5") on each jacket with the following information (or QR code and scanner app linking to information):

         a) Item Number
         b) Location Information
         c) Application Type
         d) Operating Pressure
         e) Component Type
         f) Component Size
         g) Jacket Min Max Temp

h) Insulation Thickness
i) Jacket material Hot Side
j) Jacket material Cold Side
k) Pre Photo & Post Photos
l) Pattern

b. Metal box type field-fabricated insulation jacket:

1) Fabricate two piece removable metal boxes lined with insulation of thickness as specified.

2) Sheet metal box construction in accordance with section 23 31 00 – Ductwork and as follows.

3) Materials shall be G-90 galvaneal, painted to match surrounding insulation system color.

4) Secure enclosure to equipment with repeatedly re-usable bolts, clips, or bands that do not require tools for service access or additional tape for re-assembly.

5) Fabricate joints with hemmed edges, outward bolted flanges or secure latching mechanism. Bolt flanges on 6-inch centers, starting at corners, using 3/8-inch- diameter fasteners with wing nuts.

6) For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable closed cell foam gasket material to form a vapor barrier.

D. Mechanical Equipment Insulation:

1. Thickness of insulation:

a. Heating Equipment:
1) Pumps, air separators, suction diffusers: 2 inches (R=8 minimum).

b. Cooling Equipment:
1) Pumps, air separators, suction diffusers: 1-1/2 inches (R=6 minimum).

2. Heating Equipment (Pumps, Suction Diffusers, Heat Exchangers, Tanks, Air Separators, etc.):

a. Insulation: Same as rigid board and semi-flexible duct insulation described above, in 6pcf density.
b. Prefabricate assemblies so as to be easily removable in assembled sections for service.

3. Cooling Equipment (Cold Service Pump Volutes, Chiller Barrels, Air Separators, Tanks, etc):

a. Insulation: fire-resistant, closed cell flexible (elastomeric) foam plastic, similar to Armacell "Armatuf White". May be multiple thicknesses (inner layers may be similar material without facing similar to "Armaflex AP") with offset joints for complex tight curved shapes or single thickness. Provide sheet stock with either PSA or plain backing, with manufacturer's recommended adhesive for all joints and backing, manufacturer's matching protective vapor barrier facing tape, and Corrosion Inhibitor equal to "Polyguard RG-2400".

E. Insulation Accessories:

1. Mechanical Pin Fasteners: Provide welded or adhered pins of length based on manufacturer's recommendations for insulation density and thickness, securely holding insulation with insulation manufacturer's recommended compression. Mechanical Pin Fastener types include:

   a. Stud style welded pins minimum 12 gauge diameter with matching push-on washers. Welded on with capacitor discharge type pin welder with no burn through or undercutting. Welded on prior to insulation application allowing for inspection prior to insulating.

   b. Cup head style welded minimum 12 gauge diameter with integral washers. Welded on with capacitor discharge type pin welder with no burn through or undercutting. Welded on after insulation application dis-allowing inspection of pin welds without insulation removal. Not permitted for any Class A or tighter duct, not permitted for any fire rated duct insulation application.

   c. Adhered style with perforated metal back plate (minimum 4 square inches surface area) welded to 12 gauge pins with matching push washers, bonded with full coverage of manufacturer's recommended adhesive. Not permitted for any fire rated duct insulation application.

   d. Not permitted: PSA backed "peal and stick" pins, sheet metal fastening screws, or any other penetration of duct by fasteners.

2. Insulation Securement Bands: For larger cylindrical surfaces and fire rated duct insulation, tension securement bands may be used to supplement or replace mechanical pin fasteners. Provide bands of material compatible with insulation and system being insulated, minimum ½ inch wide and as required to avoid compressing insulation at required securement tension (3/4 inch minimum for diameters over 36 inches), 24 gage thick or thicker. End buckles of similar material. Wrapping or securing with wires not permitted.

3. Insulation Covering Canvas: 8 oz., 100 percent cotton, with flame spread 10 and smoke developed 0 ratings; similar to "Thermocanvas" by Fattal, Chicago, Illinois.

4. Insulation Tapes: Provide insulation manufacturers' recommended and matching tapes, matching characteristics of exterior jacket of insulation, in widths as required and as specified below to seal all gaps and reinforce vulnerable areas in vapor barrier. Provide tapes with peel off protective coating covering high performance acrylic adhesive unless manufacturer documents superior performance of alternative recommendation.

5. Insulation Adhesives and Mastics: Provide insulation manufacturers' recommended and matching adhesives and mastics, as required and as specified below to seal all gaps and reinforce vulnerable areas in vapor barrier. Provide with water based and low VOC formulations unless manufacturer documents superior performance of alternative recommendation and performance deficiencies of water based low VOC products.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Verify that systems and equipment to be insulated have been tested and are free of defects.

C. Verify that surfaces to be insulated are clean and dry.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion inhibition coating to surfaces to be insulated as follows:

1. All non-galvanized ferrous components with a service temperature below ambient (chilled water systems): Coat with one full coverage coat of specified corrosion inhibition coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 INSTALLATION

A. General:

1. Provide thermal insulation for components shown on the Drawings as specified in this Section for the following:

a.

b. Air separators, exposed boiler supply and/or return drums, risers, and piping connections, and all other HVAC components that operate below, or more than 15 degrees F above ambient conditions.

2. Comply with manufacturer's installation instructions and recommendations.

3. Do not begin mechanical insulation until permission is granted to begin mechanical insulation installation, hydronic systems have proved drip free under pressure, duct systems have passed required duct leakage requirements and testing, indoor work areas are weather tight, and outdoor work areas are at appropriate ambient conditions.

4. Below ambient temperature applications:

   a. Provide corrosion inhibition coating as specified above.
   b. Apply vapor barrier mastic and sealant to all open ends, joints, seams, breaks, and punctures in insulation.

5. Do not use any insulation support system which causes compression of insulation, localized or widespread, to less than 75% of the rated nominal thickness. Wires wrapped around rectangular duct insulation are not permitted as insulation support.

6. Provide for durable and repeated service access as part of insulation system.

   a. Do not permanently cover inspection stampings, hand holes, manholes, plugged outlets, or similar features on equipment – provide removable labeled insulated access port with beveled and sealed insulation plug, gasketed if vapor barrier is needed, durably fabricated for repeated access.

   b. Provide removable insulated boxes as specified for Pumps, Suction Diffusers, Triple Duty, Balancing, and Control valves, and other HVAC components needing periodic maintenance or adjustment.

7. Install thermal mechanical insulation as follows:

   a. Only on clean, dry surfaces and after piping and ductwork has been tested and found to be tight.
   b. Continuously through wall or ceiling openings and sleeves.
   c. On cold surfaces with continuous unbroken vapor seal.
   d. Insulate ducts and pipes individually.

8. Where more than one layer of insulation is required to achieve specified thickness or R value, apply thinner layer first, and stagger joints between insulation layers at least 3 inches.

B. Pipe Insulation

1. Comply with manufacturer's installation instructions and recommendations. Install only when ambient temperatures are within range recommended by manufacturer. STAPLES NOT PERMITTED.

2. Provide high impact plastic wrapper on all exposed, insulated piping from finished floor to 8 ft. above finished floor.

3. Interior Pipe and Fitting Insulation: Install on all heating, cooling, and condensate piping. Seal with factory applied pressure-sealing adhesive strip on the longitudinal lap. Seal butt joints with pressure-sealing adhesive strip at least 2 inches wide. Install valve and fitting covers in all locations.

4. Insulation at Pipe Support: Refer to SECTION 23 05 29 - Hangers and Supports for material specifications of insulated piping support assembly and pipe support insulation. Complete insulation installation for the applicable pipe support insulation type to be used.

    a. Type “B” Pipe Support Insulation:

        1) Install pipe support insulation at hanger and support locations in conformance with manufacturer’s recommendations and as indicated on Drawings.

        2) Remove a section of insulation from pipe insulation and replace this section with heavy density molded fiberglass blocks without breaking vapor barrier wrap.

    b. Type “C” Pipe Support Insulation:

        1) Provide butt connection to high-density insulation sections at pipe hangers as specified in Section 23 05 29 - Hangers and Supports.

        2) Provide insulation with vapor barrier on upper half of insulated piping support assembly.

        3) Apply wet coat of vapor barrier lap cement on butt joints and finish coat of vapor barrier mastic.

        4) Tape edge of insulation section edge and insulation with white, pressure-sensitive PVC tape with tape extending over adjacent pipe insulation by at least 2 inches.

5. Pumps, Suction Diffusers, Triple Duty Valves, Balancing and Control Valves, and other HVAC components needing periodic maintenance or adjustment:

    a. Provide removable covers as specified above.

    b. Fit covers closely to component being insulated and adjacent system insulation and coincide joints with component and adjacent equipment installations allowing easy removal for service access to all parts requiring service.

    c. Valves with insulated non-condensing stem assembly: insulate and seal to stem, leaving insulated adjustable portion of valve\s exposed.

6. Surface Finish of Equipment Insulation:

a. Heating Equipment with no serviceable parts concealed: Reinforce insulation and cover with metal mesh and insulating cement. Recover with 8 oz. canvas, smoothly applied, adhered and sized with Benjamin Foster “BF-30" adhesive.

b. Cooling Equipment with no serviceable parts concealed: Glue all joints with 100% adhesive coverage of cut surfaces. Seal assembly vapor tight as required to avoid condensation. Paint all exposed insulation edges with manufacturers (white) finish, similar to “WB Armaflex” or equal, and cover all joints with manufacturer’s matching protective vapor barrier facing tape.

END OF SECTION 23 07 00

SECTION 23 08 00 - COMMISSIONING OF HVAC

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. See especially Section 01 08 00 "General Commissioning Requirements" for general commissioning process requirements and Commissioning Coordinator responsibilities.

1.2 SUMMARY

A. Section includes commissioning process requirements for the following Building Mechanical Systems, which are described in more detail in the technical specifications of Division 23.

1. Heat generation systems, including hot-water boilers, and auxiliary equipment.

2. Cooling generation systems.

3. Distribution systems, including supply and return air distribution (heating and cooling) systems.

4. Vibration, sound, and movement control systems, including vibration isolation devices, sound attenuation, and seismic restraints.

5. Energy Management and Control System.

6. Systems testing, adjusting, and balancing verification, including all of the above mentioned systems.

1.3 DEFINITIONS

A. BAS: Building automation system, also known as Energy Management and Control System (EMCS).

B. Building Mechanical Systems: All Systems, Subsystems, Equipment, and Components of the building systems traditionally known as Heating, Ventilating, Air Conditioning, Refrigeration, Plumbing, and Electrical Works.

C. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

D. CxA: Commissioning Authority –The Owner or a third party commissioning agent designated by the Owner.

E. DDC: Direct digital controls, a part of the BAS.

F. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.

G. "Systems," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

H. TAB: Testing, adjusting, and balancing.

1.4 SUBMITTALS

A. Qualification Data: For BAS and HVAC&R Testing Technician.

B. Construction Checklists: Provide construction pre-functional test checklists filled out by qualified technician for all equipment to be commissioned on this project, including but not limited to all :

1. Vibration, Sound, and Movement / Seismic controls for HVAC&R.
2. BAS.
3. Heating-water piping and accessories.
4. Cooling-water piping and accessories.
5. Boilers.
6. Chiller.
7. Hydronic Pumps.

C. Certificates of readiness and completion of installation.

D. Test and inspection reports and certificates.

E. Corrective action documents.

F. Instrumentation Calibration Information

G. Functional Performance Test Procedures

1.5 QUALITY ASSURANCE

A. BAS Testing Technician Qualifications: Technicians to perform BAS construction checklist verification tests, construction checklist verification test demonstrations, commissioning tests, and commissioning test demonstrations shall have the following minimum qualifications:

1. Journey-level or equivalent skill level with knowledge of BAS, HVAC&R, electrical concepts, and building operations.
2. Minimum three years' experience installing, servicing, and operating systems manufactured by approved manufacturer.
3. International Society of Automation (ISA) Certified Control Systems Technician (CCST) Level I.

B. HVAC&R Testing Technician Qualifications: Technicians to perform HVAC&R construction checklist verification tests, construction checklist verification test demonstrations, commissioning tests, and commissioning test demonstrations shall have the following minimum qualifications:

1. Journey-level or equivalent skill level. Vocational School four-year program graduate or an Associates degree in mechanical systems, air conditioning, or similar field. Degree may be offset by three years' experience in servicing mechanical systems in the HVAC industry. Generally, required knowledge includes HVAC&R systems, electrical concepts, building operations, and application and use of tools and instrumentation to measure performance of HVAC&R equipment, assemblies, and systems.

2. Minimum three years' experience installing, servicing, and operating systems manufactured by approved manufacturer.

3. One of the following:

    a. National Environmental Balancing Bureau (NEBB) Certified Testing, Adjusting, and Balancing Technician.
    b. Associated Air Balance Council (AABC) Certified Test and Balance Technician.
    c. Owner retains the right to waive NEBB or AABC Certification.

C. Testing Equipment and Instrumentation Quality and Calibration: For test equipment and instrumentation required to perform HVAC&R commissioning work, perform the following:

1. Submit test equipment and instrumentation list. For each equipment or instrument, identify the following:

    a. Equipment/instrument identification number.
    b. Planned commissioning application or use.
    c. Manufacturer, make, model, and serial number.
    d. Calibration history, including certificates from agencies that calibrate the equipment and instrumentation.

2. Test equipment and instrumentation shall meet the following criteria:

    a. Capable of testing and measuring performance within the specified acceptance criteria.
    b. Be calibrated at the manufacturer's recommended intervals with current calibration tags permanently affixed to the instrument being used.
    c. Be maintained in good repair and operating condition throughout the duration of use on this Project.
    d. Be recalibrated/repaired if dropped or damaged in any way since last calibrated.

D. Proprietary Test Instrumentation and Tools:

1. Equipment Manufacturer's Proprietary Instrumentation and Tools: For installed equipment included in the commissioning process, test instrumentation and tools manufactured or prescribed by equipment manufacturer to service, calibrate, adjust, repair, or otherwise work on its equipment or required as a condition of equipment warranty, perform the following:

a. Submit proprietary instrumentation and tools list. For each instrument or tool, identify the following:

1) Instrument or tool identification number.
2) Equipment schedule designation of equipment for which the instrument or tool is required.
3) Manufacturer, make, model, and serial number.
4) Calibration history, including certificates from agencies that calibrate the instrument or tool, where appropriate.

b. Include a separate list of proprietary test instrumentation and tools in the operation and maintenance manuals.

c. HVAC&R proprietary test instrumentation and tools become the property of Owner at the time of Substantial Completion.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Provide mechanical work in accordance with contract document requirements.

B. Perform commissioning tests including Materials Checks, Installation Checks, Start-up Checks, Startups, and Functional Testing, all at the direction of the CxA.

C. Attend construction phase controls coordination meetings.

D. Attend and participate in TAB review and coordination meetings

E. Attend and participate in commissioning meetings.

F. Participate in Building Mechanical Systems maintenance orientation and inspection as directed by the CxA.

G. Prepare Construction / Prefunctional Checklists and Functional Performance Test procedures and execute and document results. All Prefunctional Checklists and tests must be documented using specific, procedural forms in Microsoft Word or Excel software developed for that purpose. Prior to testing, Contractor shall submit those forms for review and approval.

H. Submit documentation required for Commissioning work. At minimum, include: Detailed Start-up procedures, Full sequences of operation, Operating and Maintenance data, Performance data, checkout sheet forms used by factory or manufacturer's field technicians, Functional Performance Test Procedures, Control Drawings, and details of Owner-Contracted tests.

I. Review and approve other relative documentation for impact on Functional Performance Tests of the systems:

1. Shop Drawings and product submittal data related to systems or equipment to be commissioned. Review and incorporate comments from the CxA.

2. Incorporate manufacturer's Start-up procedures with Prefunctional checklists.

3. Factory Performance Test Reports: Review and compile all factory performance data to assure that the data is complete prior to executing the Functional Performance Testing.

4. Complete equipment Construction / Prefunctional Checklists, Start-up certification forms, and the manufacturer's field or factory performance and Start-up test documentation: review the documentation prior to commencing with the scheduled Functional Performance Tests.

5. Final Testing Reports: Contractor or Subcontractor performing the test will review the documentation prior to commencing with the scheduled Functional Performance Tests.

6. Operating and Maintenance (O&M) information per requirements of the Technical Specifications and Division 01 requirements: To validate adequacy and completeness of the Functional Performance Tests, the Contractor shall ensure that the O&M manual content, marked-up record Drawings and Specifications, component submittal drawings, and other pertinent documents are available at the Project Site for review.

J. Provide information requested by the CxA for final commissioning documentation.

K. Schedule work so that required installations are completed, and systems verification checks and functional performance tests can be carried out on schedule.

L. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

M. Inspect, check and confirm in writing the proper installation and performance of all Work.

N. Provide technicians to assist during system verification and functional performance testing as required by the CxA

1.7 CxA'S AUTHORITY

A. Directing Commissioning.

B. Assign Commissioning Agent for various commissioning tasks to stand in for the CxA.

C. Edit and approve project-specific construction checklists and commissioning process test procedures for actual Building Mechanical Systems, assemblies, equipment, and components to be provided as part of the construction contract.

D. Verify Testing, Adjusting, and Balancing of Work are complete.

1.8 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.

2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for Building Mechanical Systems to be verified and tested.
4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Certificate of readiness certifying that Building Mechanical Systems and associated controls are ready for testing.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Certify that Building Mechanical Systems have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that Building Mechanical Systems instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify that Contractor portions of testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing report discrepancies have been corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Provide (Furnish and Install) measuring instruments and logging devices to record test data as directed by the CxA.

3.2 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning tests at the direction of the CxA.

B. Scope of Building Mechanical Systems testing includes entire HVAC&R installation. Testing includes measuring capacities and effectiveness of operational and control functions, accuracy and precision of sensing equipment, and other functional parameters as required, demonstrating that systems are performing as specified and intended. Commissioning testing includes verification of up to 30 percent of the control points, Testing and Balancing data, and other system requirements indicated in the individual technical sections, and on the drawings and

schedules of these contract documents. Parameters not otherwise specified to be tested, as required to adequately demonstrate system performance, may constitute up to 10 percent of the 30 percent (3 percent of total).

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the Building Mechanical Systems Contractors and their Subcontractors, especially the Testing, Adjusting, and Balancing Subcontractor, and HVAC&R Instrumentation and Control Subcontractor, shall prepare detailed testing plans, procedures, and checklists for Building Mechanical Systems based on the actual installed equipment and the contract documents.

E. Perform tests using design conditions whenever possible.

1. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

2. The CxA may direct that set points be altered when simulating conditions is not practical.

3. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

F. If tests cannot be completed because of a deficiency outside the scope of the Building Mechanical System, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests. If deficiencies cannot be resolved, refine tests as required to adequately test Building Mechanical Systems within the constraints of the deficiency.

G. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.3 TESTING, ADJUSTING, AND BALANCING (TAB) VERIFICATION

A. Prior to performance of TAB Work, provide copies of approved sample report forms, checklists, and certificates to the CxA.

B. Notify the CxA at least 10 days in advance of TAB Work, and provide access for the CxA to witness Testing, Adjusting, and Balancing Work.

C. Subsequent to approval of formal TAB report, TAB Work will be subject to field verification. Provide technicians, instrumentation, and tools to verify testing and balancing of Building Mechanical Systems at the direction of the CxA. Roughly 10% of required TAB data points identified in TAB specification will be selected for subsequent field verification.

1. The CxA will notify TAB Subcontractor 10 days in advance of the date of field verification. Notice will not include data points to be verified..

2. The TAB Subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.

3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.

4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.4 SPECIFIC COMPONENT ANS SYSTEM COMMISSIONING TESTS

A. Heat Generation Systems

1. Boiler Testing: Testing requirements are specified in Division 23 Section "Condensing Boilers", Paragraph 3.4.D. Performance Tests. Provide submittals, test data, inspector record, and boiler performance certification to the CxA.

B. Cooling Generation Systems

1. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, refrigerant compressors and condensers, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested, as required demonstrating that any selected operating performance criteria are met or exceeded.

C. General Hydronic System Testing

1. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in Division 23 piping Sections. HVAC&R Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

a. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.

b. Description of equipment for flushing operations.

c. Minimum flushing water velocity.

d. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

D. Hot Water Distribution Systems

1. Heating-Water Supply Temperature Control:

    a. Prerequisites: Installation verification of the following:

        1) Startup of boiler.

        2) Startup of heating-water pump(s).

        3) TAB of heating-water flow and pressure.

        4) Input Device: Heating-water supply temperature sensors, thermometers, and thermostatic devices.

        5) Output Device: Control valve.

        6) Display the following at the operator's workstation:

            a) Heating-water supply temperature.
            b) Heating-water supply temperature set point.
            c) Control-valve position.

    b. Scope: Heating-water system.

    c. Purpose: Control of heating-water supply temperature at input device.

    d. Conditions of the Test:

        1) Minimum heating-water flow.
        2) Midrange Heating-Water Flow: 50 to 60 percent of maximum.
        3) Maximum heating-water flow.

    e. Acceptance Criteria: Under all conditions, heating-water supply temperature is within plus or minus 2.0 deg F of set point.

2. Heating-Water Supply Temperature Reset:

    a. Prerequisites: Installation verification of the following:

        1) Startup of boiler.

        2) Startup of heating-water pump(s).

        3) TAB of heating-water flow and pressure.

        4) Input Device: Heating-water supply temperature sensors, thermometers, and thermostatic devices.

        5) Input Device: Outdoor-air temperature sensor;

        6) Output Device: Control valve.

        7) Display the following at the operator's workstation:

a) Outdoor-air temperature.
b) Heating-water supply temperature.
c) Heating-water supply temperature set point.
d) Control-valve position.

b. Scope: Heating-water system.

c. Purpose: Control of heating-water supply temperature at heating-water supply temperature input device in response to variable outdoor-air temperature input; outdoor-air sensor.

d. Conditions of the Test: Outdoor-air temperature input value may be overridden for this test.

1) Low Temperature: Outdoor-air temperature between minus 30 and 0 deg F.
2) Midrange Temperature: Outdoor-air temperature between 30 and 45 deg F.
3) High Temperature: Outdoor-air temperature above 65 deg F.

e. Acceptance Criteria: Heating-water supply temperature resets in straight-line relationship with outdoor-air temperature for the following reset schedule. Under all conditions, heating-water supply temperature is within 2.0 deg F of set point.

1) 160 deg F heating water when outdoor-air temperature is minus 10 deg F.
2) 110 deg F heating water when outdoor-air temperature is 45 deg F.
3) Under all conditions, heating-water supply temperature is within plus or minus 2.0 deg F of set point.

3. Pump Testing and Acceptance Procedures: Testing requirements are specified in Division 23 Section "Testing, Adjusting, and Balancing for HVAC". Provide submittals, test data, inspector record, VSD setup reports, and pump alignment certification to the CxA. Pumps shall deliver the design flow rate and pressure using no more energy than as scheduled. Pump alignment shall be as specified. VSD setup and adjustment shall be as specified.

4. Control Primary Circulating Pump(s):

a. Prerequisites: Installation verification of the following:

1) Startup of heating-water pump(s).
2) Input Device: Outdoor-air temperature; outdoor-air sensor.
3) Output Device: Heating-water pump; DDC system command to starter relay.

4) Display the following at the operator's workstation:

a) Outdoor-air temperature.
b) Operating status of primary circulating pump(s).

b. Scope: Heating-water pump(s) and associated controls.

c. Purpose: On-off control of heating-water pump(s) in response to variable outdoor-air temperature input; outdoor-air sensor.

d. Conditions of the Test:

1) High Temperature: Outdoor-air temperature above 65 deg F.
2) Low Temperature: Outdoor-air temperature below 65 deg F.

e. Acceptance Criteria:

1) High Temperature: Pump(s) are off when outside-air temperature is above 65 deg F.
2) Low Temperature: Pump(s) are on when outside-air temperature is below 65 deg F.

E. Vibration, Sound, and Movement Control Systems

1. Coordinate Walk-through with CxA to verify installation is in accordance with specifications and submittals. Provide submittals, test data, inspector record, and Sound Attenuator performance certification to the CxA.

F. Energy Management and Control System

1. Testing requirements are specified in Division 23 Section "Instrumentation and Control for HVAC", Section 3.11 SYSTEM TESTING AND COMMISSIONING. Provide submittals, test data, inspector record, and EMCS performance certification to the CxA.

2. Provide password and any other hardware and software as required to enable CxA to communicate directly, with full graphics and control capability, with the EMCS from the CxA's office over an internet browser interface. Install complete early in project.

END OF SECTION 23 08 00

SECTION 23 09 00 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

B. Review and study all drawings and this entire project specification to become familiar with the equipment and system operation as designed and to verify the quantities and types of controllers, valves, dampers, operators, alarms, points, etc., required.

1.2 SUMMARY

A. The Board of Education of the Beacon City School District has decided to purchase controls components (including installation and wiring), engineering, programming and project management labor from Day Automation Systems, Incorporated, using NYS OGS contract pricing, through NYS OGS Group # 77201, Award # 23150, Contract # PT68783. Products and all other controls system components will in general conform to this specification. Please contact Scott Sullivan for additional information:

Scott Sullivan
Account Executive, Day Automation Systems, Inc.
21 Aviation Rd
Albany, NY 12205
+1 (518) 729-6919
scott.sullivan@dayautomation.com

1. Provide installation of the Energy Management and Control System (EMCS) in full accordance with this specification, by the owner's Temperature Controls Contractor (TCC) as described in quality assurance below and as approved by the Architects and Engineers, to be paid as a direct consultant to the district. Include both removals of existing controls as specified below and installation of new controls as follows:

   a. Control Valves and their actuators,

   b. Automatic Dampers and their actuators,

   c. All control devices: input, output, and logical, including their interface with and mounting in or on piping, sheet metal and general building systems.

   d. All actuation devices for existing valves and dampers should they be involved,

   e. All wiring between all EMCS components and all power source wiring for them,

   f. Removal of all discontinued controls, including but not limited to all pneumatic control air components (piping, compressors, specialties, etc., as shown and as coordinated with continued use).

2. Any incidental installations and work not covered above including but not limited to inspecting, testing, and SV acceptance of controls components installation, and controls programming, testing, adjusting, and commissioning labor shall be included in the product portion of this work and shall be provided complete by the Standardized Vendor, resulting in a complete functional control system per specifications.

B. This section describes the requirements for a complete Energy Management and Control System (EMCS) for building mechanical systems and components, based upon Direct Digital Control (DDC) logic including WEB served operator interface via the existing computer Operator Work Stations, distributed microprocessor controls, and integrated electronic components, interfaces, and actuation, all installed complete as specified.

C. Perform all work in cooperation with the Owner, Architect, Construction Manager, and other Prime Contractors. Coordinate all work with the construction schedule established by the Owner, Architect, and Construction Manager, and immediately report any delays including circumstances causing the delays.

D. The mechanical contractor is responsible to maintain pressure tight HVAC systems. Turn over all control components that are installed in the pressure tight HVAC systems over to the mechanical contractor (for installation), to include:

1. All piping mounted controls components, including control valve, valve and control manifolds, pressure and temperature sensor taps, flow switches, thermal wells, and similar devices.

2. All airside mounted controls components, including dampers, pressure and temperature sensor probe taps, flow sensors, and similar devices.

E. It is the Owner's intent to extend and establish a fully compatible and interoperable Energy Management and Control System (EMCS) network as an extension of the Beacon City School District's distributed **Schneider Electric** EMCS. This shall be accomplished through the general removal of all existing controls components serving the systems affected by this project, and providing new controls complete as specified herein. Provide new graphic displays for all new controls, and custom configure graphic displays to meet Owner and Engineer requirements. Provide each of the following portions of the complete EMCS as a standalone system that can communicate with any other Direct Digital Control (DDC) system which is following the same protocol:

1. Operator Work Stations (OWS): Provide software and hardware updates as required for existing OWS, installed at a location of the Owner's choosing; and integrate this project's controls complete with the EMCS at the District's facilities offices and other buildings. Provide software and programming for OWS and update software at existing EMCS complete to incorporate this addition. Provide guaranteed seamless two way communications from each, including full control, with the EMCS provided as a part of this project and the existing campus EMCS.

a. The OWS shall monitor, display, and control information from the EMCS through one software package. Rebooting of the OWS, or opening a separate program to access the existing building's multiple systems is not acceptable.

b. The OWS shall allow customization of the system as described in this specification.

c. The OWS shall:

1) Provide new color graphic control panels for all equipment provided or modified as part of this project, as outlined below and on the drawings,
2) Allow operators to view and work with all DDC points associated with all DDC equipment provided or modified as part of this project,
3) Allow operators to create custom graphics and/or control programming generation for any and all new equipment.

2. Network Control Unit (NCU): Provide central processor WEB server capability for and fully integrated two way communications with all energy use and management equipment provided or modified by this project, along with any third party stand-alone controls provided by the manufacturers of the Air Handlers, Refrigeration Machinery, Boilers, and Variable Speed Drives. NCU shall be capable of supporting a minimum of 127 field devices, providing reserve capacity for addition of future points and expansion of DDC system into building. The DDC system's NCU shall communicate with the OWS entirely using the BACnet protocol, with a conformance class of 5, as defined in the latest officially amended version of ANSI/ASHRAE 135-2004.

3. Distributed Controls: System controls shall include but not be limited to all controllers, sensors, devices, wiring, and all other hardware and software required to perform all of the functions and controls described later in this specification and on the drawings, including fully integrated two-way control of boilers, chiller, condensing units, pumps, VSDs, heat exchanger, and all associated temperatures, pressures, and other controllable parameters of mechanical equipment and systems provided or modified as part of this project. Provide control through the EMCS as outlined in the general controls sequences of operations below, as shown on the project drawings, and with controls similar to as shown where the exact configuration is not explicitly covered by the drawing and specification sequence of operations.

4. Engineer's Office: Provide password and any other hardware and software as required to enable Engineer to communicate directly, with full graphics and control capability, with the EMCS from the Engineer's office over an internet browser interface. Install complete early in project. Engineer will utilize to check progress of installation, to check operation of system during the punch list period, and to monitor system operation after completion of the work.

1.3 DEFINITIONS

A. DDC: Direct Digital Control.

B. PC: Personal computer.

C. EMCS: Energy Management and Control System, includes the complete automatic temperature control and energy use management system specified herein, based upon DDC technology, incorporating all necessary input and output devices, connecting hardware, software, and accessories.

D. OWS: Operator Workstation which is the main operator interface with the EMCS, comprised of a PC with graphical two way interface with, and data base and control capabilities for, the entire EMCS.

E. UC: Unitary Controller, a version of the SCU which is a smaller microprocessor-based controller, possibly pre-programmed to function specifically for the operation of a particular piece of equipment, such as a standard configuration air handler, unit ventilator, variable air volume box, lighting circuit, etc.

F. SCU: Standalone Control Unit, a microprocessor-based controller panel, which contains all necessary control logic to carry out its own, local functions, and can function independently of other SCU panels and all remaining portions of the EMCS. The SCU may serve one or many types of HVAC equipment and is not factory programmed for only one purpose.

G. NCU: Network Control Unit, a secure central processing unit microprocessor based WEB server residing directly on the Owner's Ethernet TCP/IP LAN/WAN; providing direct communications to SCUs, UCs, and other field devices; integrating and processing their data and presenting it as custom HTML WEB pages in accordance with custom programmed graphical interface edited at an OWS.

H. LAN: Local Area Network - the Owner's existing Ethernet communications backbone which connects all of the owners buildings (and various rooms) on their campus. To be used by the Contractor where possible to connect OWSs, NCUs, SCUs, and UCs. Coordinate with Owner to determine extent of interconnection possible.

I. BACnet: A Data Communication Protocol for Building Automation and Control networks as defined in American National Standard ANSI/ASHRAE 135-1995, including any updates or revisions to this document.

J. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.

K. MS/TP: Master slave/token passing.

L. I/O: Input/output.

M. Modbus: a serial communications protocol originally published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controllers (PLCs).

N. PID: Proportional plus integral plus derivative.

O. RTD: Resistance temperature detector.

P. System Modem: a modem which is installed on the EMCS so that a remote SCU, UC, or OWS can connect up to the LAN and can function the same as if it were locally-installed.

Q. System Printer: a printing device which is installed on the LAN so that all EMCS components can utilize it as an output device.

R. SV: Standardized Vendor of controls components.

S. TCC: Temperature Controls Contractor - The entity responsible for the work described by this section of specifications.

1.4 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.

2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.

3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.

4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.

5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.

6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.

7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.

8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

   a. Water Temperature: Plus or minus 1 deg F.
   b. Water Flow: Plus or minus 5 percent of full scale.
   c. Water Pressure: Plus or minus 2 percent of full scale.
   d. Space Temperature: Plus or minus 1 deg F.
   e. Ducted Air Temperature: Plus or minus 1 deg F.
   f. Outside Air Temperature: Plus or minus 2 deg F.
   g. Dew Point Temperature: Plus or minus 3 deg F.
   h. Temperature Differential: Plus or minus 0.25 deg F.
   i. Relative Humidity: Plus or minus 5 percent.
   j. Airflow (Pressurized Spaces): Plus or minus 3 percent of reading.
   k. Airflow (Measuring Stations): Plus or minus 5 percent of reading.
   l. Airflow (Terminal): Plus or minus 10 percent of full scale.
   m. Air Pressure (Space): Plus or minus 0.01-inch wg.
   n. Air Pressure (Ducts): Plus or minus 0.05-inch wg.
   o. Carbon Monoxide: Plus or minus 5 percent of reading.
   p. Carbon Dioxide: Plus or minus 50 ppm.
   q. Electrical: Plus or minus 5 percent of reading.

1.5 QUALITY ASSURANCE

A. Provide all labor, material, equipment, software, and programming necessary to meet the functional intent of the EMCS, and the rigid requirements as specified herein and as shown on the drawings. Provide, without additional cost to the Owner, all equipment and labor not specifically referred to herein or on the plans, which are required to meet the functional intent expressed in the sequences of operations herein or on the drawings. The contractor is responsible for all costs of changes in the work required by substitute equipment.

B. The TCC must have been in business for at least ten years, providing DDC systems as their primary business with documented success. They shall have a minimum of five years as a manufacturer's authorized distributor or branch office representative for one or more of the manufacturers specified. They must have a trained staff of application engineers, project managers, software engineers, commissioning staff, training staff, and service staff experienced in the configuration, programming and service of the EMCS. They must have a local service department and stock the manufacturer's standard replacement parts.

C. The EMCS shall be installed only by skilled mechanics employed directly by the TCC except wiring may be installed by their first tier subcontractor under the TCC project manager's direct supervision. Any subcontractor shall have documented success installing controls with the TCC for a minimum of five years prior to this project. Sub-contractual relations shall in no way relieve the contractor of any of their obligations under their contract.

D. The TCC shall have a training facility with regularly scheduled training as outlined below so as to provide ongoing regularly scheduled application training.

E. Manufacturer must be a firm regularly engaged in manufacture of microprocessor temperature control equipment, of configuration and capabilities similar to or better than specified equipment, for at least ten years, and must have similar earlier vintage models that have been in continuous satisfactory use for not less than ten years in similar service.

F. All work shall conform to the following Codes and Standards, as applicable to the Contracted Work at the Project job site and to the relevant Authorities Having Jurisdiction at the Project site. All products shall be labeled with the appropriate approval markings. In the case of conflict or discrepancy, the latest and most stringent regulation or code shall apply.

1. National Electrical Code (NEC) and applicable local Electrical Codes.
2. Underwriters Laboratories (UL) listing and labels.
3. Underwriters Laboratories of Canada (ULC) listing and labels.
4. UL 864 UUKL Smoke Control.
5. UL 864 UOJZ Fire Protection Signaling Systems.
6. UL-873; Temperature Indication and Regulating Equipment.
7. UL-916; Energy Management Systems for BAS components and ancillary equipment.
8. NFPA 70 – National Electrical Code.
9. NFPA 92A and 92B Smoke Purge/Control Equipment.
10. Factory Mutual (FM).
11. American National Standards Institute (ANSI).
12. National Electric Manufacturer's Association (NEMA).
13. American Society of Mechanical Engineers (ASME).
14. Institute of Electrical and Electronic Engineers (IEEE).
15. American Standard Code for Information Interchange (ASCII).

16. Electronics Industries Association (EIA).
17. Occupational Safety and Health Administration (OSHA).
18. American Society for Testing and Materials (ASTM).
19. Federal Communications Commission (FCC) including Part 15, R.F. Devices.
20. Americans Disability Act (ADA).
21. Uniform Building Code (UBC).
22. NEMA 250 – Enclosures For Electrical Equipment (1,000 V Maximum).
23. NFPA 101 – Life Safety Code.
24. IESNA – Illumination Engineering Society of North America.
25. UL 50 – Cabinets and Boxes.

1.6 GUARANTEES

A. Guarantee the EMCS complete to be free from defects in durability, materials, and workmanship, except for damages from other causes, for a period of one year after final acceptance.

B. Guarantee System to:

1. Maintain temperatures within +/- 1°Fof setting, within capacity of HVAC equipment.

C. Provide a one (1) year maintenance agreement to run concurrently with the Guarantee period. The maintenance agreement shall consist of 24 hour emergency and scheduled service (once per month minimum) as required addressing reported issues, for inspection and adjustment of operating controls, and replacement of parts or instruments found deficient or defective during this period.

D. Provide system backup and restore, software, programming, and sequence of operations enhancements, revisions, and adjustments at no charge to the Owner both during construction and commissioning and during this warrantee period.

1.7 SEQUENCE OF OPERATION

A. Refer to controls schematic drawings including written sequence of operations for specific pieces of equipment. Provide controls as specified and as required to achieve sequence of operations shown on drawings as well as specified below in general programming, and with controls similar to as shown where the exact configuration is not explicitly covered by the drawing and specification sequence of operations.

1.8 SUBMITTALS

A. The majority of the required submittals are for the State Contract Controls Vendor Day Automation Systems, Inc. Installation related submittals are required of the Mechanical Contractor.

B. Submit on controls in multiple portions as job progresses. Include in each submittal a summary just inside the cover sheet of previously approved portions of submittal, currently submitted portions, and those portions not submitted yet. During closeout documentation, assemble all approved controls submittals into one package designed for use as both an installation and a maintenance manual.

C. Technical Submittals:

1. Submit a complete Technical Proposal within 30 days of contract award, complete with the diagrams, product information, and supporting documentation outlined below. Arrange the Technical Proposal in order of the specification article numbers, with tabs (bookmarked .pdf files for electronic submittals) at each division. Design Technical Proposal for use as both a clear demonstration of qualifications and as an installation and maintenance manual.

2. Include the following in a complete Technical Proposal:

a. Description of service capabilities including resumes for service technicians and designers that will be responsible for this project.

b. A list of local jobs (three minimum) of similar type and size the bidder has installed, utilizing the products proposed for this project, with Owner's representatives and engineer of record's names and telephone numbers for reference. This list should directly reflect:

1) Projects that include direct integration to third party microprocessor controllers of the type specified within this scope.

c. EMCS network wiring diagram showing interconnection of all panels, workstations, system printer(s) etc. A diagram describing system architecture for this project with product code numbers for workstation, network controllers, application specific controllers, transducers, sensors, communication networks, etc.. Diagram shall include all components intended to be used to meet or exceed specification requirements, shown in their functional relation to one another.

d. Provide information on owner training provided as part of the bid package as well as additional opportunities and factory schools available with associated costs. Include details of Operator HVAC Training System as specified herein.

e. Hardware Product Data Bulletins for all specified products. Each bulletin shall describe product features, model numbers and manufacturer's name.

f. Software Product Data Bulletins for all specified software features. Each bulletin shall describe product features, model numbers, and manufacturer's name.

3. As job progresses and in ample time for review and iteration as required for complete approval, submit the following:

a. Complete written description of all proposed control sequences and control strategy, with any deviations from the specified sequence of operations highlighted and explained.

b. Detailed wiring and piping control diagrams and system description for each system.

c. Detailed layout and nameplate list for all control panels, including pneumatic, unit-specific controllers, data-gathering panels, microprocessor-based panels, third party microprocessor controllers, etc.

d. Damper schedule giving size, type, velocity, pressure drop, configuration, location, and number, type, and size of motorized actuators. Include apparatus bulletins and data sheets. Include all existing to remain dampers proposed for reuse along with comments on condition.

e. Valve schedule giving valve identification tag abbreviation, location, service, failsafe position, pipe size, valve size, make/model, type, configuration, design flow, capacity index (cv), and pressure drop. Include apparatus bulletins and data sheets.

f. Schedule showing direct integration to all third party microprocessor controllers included in this project, including all points available in a point listing describing point type (analog input, binary input, analog output and binary output), point address, units, applicable software interlocks (alarm, interlock, sequence, etc.), and a verbal description of the function and intended control of the point.

g. Termination schedule and point listing describing point type, (analog input, binary input, analog output and binary output), physical point location (eg. AHU #1 mixed air) and software interlocks (alarm, interlock, sequence, etc.).

h. A complete listing of inputs and outputs, control loops and/or routines, timing functions, and facilities management system functions for each controlled system. This listing shall include point logical names and identifiers.

i. For all equipment, submit copy of written installation, maintenance, and operating directions and details, along with manufacturer's printed installation instructions for all equipment furnished, showing required installation and location of the above items.

j. Provide a sample of program language and description of how programming is accomplished.

k. Color printout sheets of representative samples of all proposed graphics and text based OWS pages.

D. Installation Submittals:

1. Submit professional qualifications resumes for installation technicians who will be responsible for this project.

2. Submit name of any proposed installation subcontractors, along with their statement of qualifications, resumes for installation and service technicians who will be responsible for this project, and 3 local references for comparable recent jobs.

3. Software and Firmware Operational Documentation: Include the following:

    a. Software operating and upgrade manuals.
    b. Program Software Backup: On a magnetic media or compact disc, complete with data files.
    c. Device address list.
    d. Printout of software application and graphic screens.
    e. Software license required by and installed for DDC workstations and control systems.

4. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

5. Field quality-control test reports.

6. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

    a. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
    b. Interconnection wiring diagrams with identified and numbered system components and devices.
    c. Keyboard illustrations and step-by-step procedures indexed for each operator function.
    d. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
    e. Calibration records and list of set points.

1.9 RELATED AND ANCILLARY WORK

A. Electrical control wiring associated with building fire alarm system and duct smoke detectors: Installation is specified under Division 26.

B. Power source wiring for general (non-controls) HVAC motorized equipment: Installation specified under Division 26.

C. Provide power source wiring for all EMCS equipment, complete back to breakers designated as temperature control power breakers on electrical drawings or other approved electrical power panel space. Includes all controls power source wiring, communication wiring, and actuated device power and control wiring. Installation specified both herein and in applicable sections of Division 26.

D. Provide network connectivity and communications wiring for all EMCS equipment, complete back to Owner’s network connection designated as temperature control connection on electrical drawings or otherwise indicated by Owner. Coordinate with District IT personnel. Includes all controls communication wiring, as specified both herein and in applicable sections of Division 26, 27, and 28.

E. Piping work as required to maintain pressure tight integrity of all hydronic, potable water, and refrigerant based systems for the installation of all piping mounted controls components, including control valve installation, valve and control manifolds, pressure and temperature sensor taps, flow switches, thermal wells, and similar devices: Installation specified both herein and under applicable piping section.

F. Sheet metal work as required to maintain pressure tight integrity of all airside systems for the installation of all airside mounted controls components, including dampers, pressure and temperature sensor probe taps, flow sensors, and similar devices: Installation specified both herein and under applicable sheet metal and ductwork sections.

G. Insulation work as required to maintain the thermal integrity of the various systems associated with and subsequent to controls component installations: Installation specified in Division 23 section on Insulation.

H. For all equipment: Provide and follow written installation directions and details, with manufacturer's printed installation instructions for all equipment furnished, showing required installation and location of the above items.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for submittal, approval, fabrication, and shipping of control devices to equipment manufacturer in ample time for factory installation without impacting project schedule.

B. System Software: Update to latest version of software at Project completion.

1.11 INSTRUCTION AND TRAINING

A. Interactive Operator HVAC Training System

1. General:

a. Provide necessary software and learner workbooks to form a complete HVAC training system as described in this specification. Provide two (2) copies of the software and three (3) copies of the learner workbooks for the Owner's use.

b. Provide a quick reference guide for users to trouble shoot operational challenges during standard use.

2. Operation:

a. Usable by multiple students while maintaining records and bookmarks for each learner.

b. Operates from CD-ROM without the necessity of installing the program on a hard disk, or installed on hard drive. Students records stored on the computer's hard drive.

3. Features:

a. Integrates text and graphics to explain the concepts of building environments, the systems that deliver these environments, and the controls that manage these systems.

b. Modular in design to allow the student to select and view whichever sections are appropriate in any order desired.

c. Menu driven with complete sections identified on the menu.

d. Includes a glossary of terms readily accessible from within the lessons allowing the review of a definition without losing the current lesson location.

e. Incorporates navigational aids including a learning map that allows the student to move directly to a desired section from the map.

f. Includes a password protected registration system to record student responses and bookmark progress. The registration system shall allow students to return to their previous lesson location or start the lesson again when logging on after the first session.

g. Includes a password protected mentor mode which can be used to monitor progress throughout the training program.

h. Includes mastery exam for each of the three sections of the training program; environments, systems, and controls.

i. Includes a final test, enabled by the mentor, to assure satisfactory completion of the learning program.

j. Includes a completion form upon successful completion of the training experience.

B. Factory Authorized Control System Training:

1. Provide factory trained and authorized instructors and control technicians to instruct the Owner's operating personnel.

2. Factory authorized onsite training - Provide two (2) onsite training sessions each two (2) hours in duration covering network layout, controllers, and software functions. Both generic and product specific training shall be provided. Sessions shall be scheduled by the Contractor at the Owner’s convenience, at any time up to two years after system installation.

3. Provide videotaping and audio taping of all training sessions, both off and on site. Turn over two copies of tapes and three copies of maintenance manual to Owner’s representative.

C. Include in closeout documentation signed letter of acknowledgment of receipt of factory authorized training, videotapes, and maintenance manuals.

1.12 COORDINATION

A. Coordinate all controls work required for a complete operable controls system as specified. Carefully review project summary and scoping documentation and coordinate with contractors responsible for various ancillary portions of controls work. Where supportive or ancillary work is not specifically assigned to another contractor, provide complete as required for a complete operable system.

B. Coordinate equipment with Division 28 Sections on Fire Detection and Alarm Systems to achieve compatibility with equipment that interfaces with that system.

C. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

D. Coordinate equipment with Division 26 Sections on Electrical Power Monitoring and Control to achieve compatibility of communication interfaces.

E. Coordinate equipment with Division 26 Sections on Panelboards to achieve compatibility with starter coils and annunciation devices.

F. Coordinate equipment with Division 26 Sections on Motor Controls to achieve compatibility with motor starters and annunciation devices.

G. Coordinate size and location of concrete bases. Refer to Section 23 05 00 – Common Work Results for HVAC Systems for additional information.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Standardized Vendor (SV):

1. Schneider Electric Controls as installed by Day Automation System, Incorporated.

B. In other Part 2 articles where specific components are described, the basis of design and named equivalent TCCs integrate multiple manufacturers' components into a coherent system. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified:

1. Armstrong.
2. Automated Logic Corporation.
3. Functional Devices Inc.
4. Honeywell International Inc.; Home & Building Control.
5. Invensys Building Systems.
6. Johnson Controls, Inc.; Controls Group.
7. KMC Controls/Kreuter Manufacturing Company.
8. Siemens Building Technologies, Inc.
9. Schneider Electric.
10. Solidyne Corp.

11. Staefa Control System Inc.; Siemens Building Technologies, Inc.
12. TAC Americas, INC.
13. TCS/Basys Controls.
14. Tekmar Control Systems, Inc.
15. Teletrol Systems Incorporated.
16. Tour & Andersson Control, Inc.
17. Trane; Worldwide Applied Systems Group.
18. Triangle MicroSystems, Inc.
19. Victaulic, Inc.
20. Voltec, Inc.

2.2 GENERAL SYSTEM ARCHITECTURE

A. The EMCS shall consist of the following:

1. Operators' Workstations (OWS).

2. File Server (FS).

3. Network Control Units (NCU).

4. Standalone Control Units (SCU).

5. Application Specific Unitary Controllers (UC).

6. All controls power wiring 120 volts or less, all network and communication wiring, fiber optic cable, and other controls communication media.

7. All EMCS communications devices.

8. All related field devices including remote I/O cabinets, transformers and power supplies, relays, contactors, transducers, switches, cabling, and related electronic control equipment.

9. All necessary software and custom programming, including graphics and reports.

10. All necessary inputs, outputs, and devices required to meet the features and intent described herein including but not limited to:

    a. Transducers.
    b. Water flow switches and sensors.
    c. Differential Pressure sensors.
    d. Hydronic control valves.
    e. Opposed blade (control) or parallel blade (shutoff), low leakage dampers.
    f. Temperature, pressure, and humidity sensors and safety devices.
    g. Electronic valve and damper actuators.

11. All other equipment necessary for a complete, operational, EMCS.

B. The design of the EMCS shall network OWSs, FCs, NCUs, SCUs, UCs, and all sensors, safeties, actuators, and other devices. Inherent in the system's design shall be the ability to expand or modify the network via the Internet, the Level 1 LAN, the Level 2 bus, or via auto e-mail or auto-dial telephone line modem connections, or via a combination of all four networking schemes. LAN communications between buildings shall be standard ETHERNET TCP/IP and shall be compatible with the district's existing ETHERNET LAN.

C. The EMCS shall:

1. Be modular in nature, with distributed controllers operating in multi-user, multi-tasking environment on token-passing network.

2. Be re-programmable and programmed to control mechanical, electrical, and plumbing systems.

3. Be capable of integrating multiple building functions, equipment supervision and control, alarm management, energy management, historical data collection, and archiving.

4. Permit expansion of both capacity and functionally through the addition of components and programming.

5. Include an operator workstation which permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

6. Not be dependent upon any single device for alarm reporting and control execution. Each DDC panel shall operate independently by performing its own specified control, alarm management, operator I/O, and historical data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

D. The system architecture shall consist of no more than two communication levels as follows:

1. Level 1 shall be on the Owner's ETHERNET LAN as possible within the constraints of this specification. Contractor shall field verify extent and capacity of existing LAN with Owner prior to creation of network layout drawings, and shall include any and all extensions of the LAN required for complete and robust functioning of the EMCS:

a. Level 1 communications shall use the BACnet protocol.

b. This LAN operates under ETHERNET protocol at 10 Mbps or other speed as determined by the Owner. The Level 1 LAN will provide transfer of point data, alarms and file activity among OWSs, NCUs, and SCUs.

c. Any data from a Level 2 controller can also be transmitted onto this bus through a Level 1 controller. The high speed LAN shall support multi-user communications and multi-session activity. That is, all global data sharing shall occur simultaneously with the transmission of alarm data or user activity.

d. OWSs and NCUs shall reside directly on the LAN such that communications may be executed directly between controllers, directly between workstations, and between controllers and workstations, on a peer-to-peer basis.

e. SCUs and UCs may reside directly on the Level 1 Lan at the TCCs option.

2. Level 2 shall be on a EIA-485 bus or other comparable technology, designed to support a family of dedicated local controllers for control of HVAC equipment and lighting. The Level 2 bus shall communicate bi-directionally with the Level 1 LAN through NCU controllers for transmission of global data:

a. The Level 2 bus, or field bus, shall support local control units (SCUs and UCs) of modular size for operation of the building's HVAC and lighting systems. This bus shall operate at a minimum speed of 200 kbps with a length of 4000 feet and 10Mbps with a length of 150 feet, with 32 nodes before requiring a network repeater. A minimum of 127 controllers shall be configurable on the field bus.

b. The field bus shall permit peer-to-peer communications among all Level 2 controllers and allow simultaneous communications with portable computer service tools that are connected to a Level 2 controller. Failure of any Level 1 NCU controller shall not impair the operation of its associated field bus.

c. All Level 2 field wiring that connects non native BACnet unitary controllers shall have an additional wiring set run in parallel dedicated for future use by native BACnet replacement controllers.

E. NCUs shall be able to access any data from, or send control commands and alarm reports directly to any other NCU or combination of NCUs on the network without dependence upon a central processing device. NCUs shall also be able to send alarm reports to multiple operator workstations without dependence upon a central processing device.

F. Dynamic Data Access:

1. All operator devices, network resident, internet connected, or connected via dial-up modems, shall have the ability to access all point status and application report data, or execute control functions for any and all other devices via the LAN. Access to data shall be based upon logical identification of building equipment.

2. Access to system data shall not be restricted by the hardware configuration of the EMCS. The hardware configuration of the EMCS network shall be totally transparent to the user when accessing data or developing control programs.

3. All points contained on Level 1 and Level 2 controllers shall be considered global points. Any program in any controller on the network shall be able to reference any point in any controller regardless of its location on the network.

G. General Network Design:

1. Network design shall include the following provisions:

a. Data transfer rate for alarm reporting, report generation from multiple controllers, and upload/download between SCUs and OWSs shall be a minimum of 2.5 Megabaud.

b. Support of any combination of controllers and operator workstations directly connected to the local area network. A minimum of 50 devices shall be supported on a single local area network.

c. Detection and accommodation of single or multiple failures of either OWSs, SCUs, or the network media. The network shall include provisions for automatically reconfiguring itself to allow all operational equipment to perform their designated functions as effectively as possible in the event of single or multiple failures.

d. Message and alarm buffering to prevent information from being lost.

e. Error detection, correction, and re-transmission to guarantee data integrity.

f. Default device definition to prevent loss of alarms or data, and ensure alarms are reported as quickly as possible in the event an operator device does not respond.

g. Commonly available, multiple sourced, networking components and Ethernet protocols shall be used to allow the EMCS to coexist with other networking applications on the Owner's existing LAN/WAN. Ethernet and BACnet are acceptable technologies. BACnet system shall conform to the latest ASHRAE Standards and recommendations.

h. Use of an industry standard IEEE 802.x protocol.

i. Provide synchronization of the real-time clocks in all EMCS panels.

2.3 OPERATOR WORK STATION (OWS)

A. Desktop Workstation Computer:

1. Existing to remain – upgrade software and hardware as required.

B. Operator Workstation Software

1. Operating System: Microsoft Windows XP Professional, 7 Business / Enterprise Professional, or comparable OS (verify with Owner and provide system compatible with Owner's IT system), with high-speed Internet access.

2. EMCS Application Software General Requirements:

a. The software shall communicate with the existing EMCS over the Owner's LAN using ASHRAE 135 and ISO 8802-3 (Ethernet) datalink/physical layer protocols.

b. The software shall be a standard application for the off the shelf MS Windows OS selected above, and shall not require a dedicated OWS, nor a different operating system from the Owner's other office management software.

c. Standard utility software packages shall be available through local retail outlets.

d. The OWS shall output advisories and unacknowledged change-of-state or out-of-limits occurrences in a dedicated and protected area of the viewing screen.

e. Graphical and Text Based Displays: At the option of the user, Operator workstation shall provide consistent graphical or text based displays of all system points and application data described in this specification. Point identification, engineering units, status indication and application naming conventions shall be the same at all workstations.

f. Individual point information shall be coded via eight different colors. These colors shall be defined with respect to system type and condition.

g. Multiple, Concurrent Displays: provide the ability to simultaneously view several different types of system displays in overlapping windows to speed building analysis. For example, provide the ability to simultaneously display a graphic depicting an air handling unit, while displaying the trend graph of several associated space temperatures to allow the user to analyze system performance. If the interface is unable to display several different types of displays at the same time, the TCC shall provide at least two networked operator stations.

h. Employ browser-like functionality for ease of navigation, with a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. Provide menu-pull downs and toolbars, "hot-button" commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System or basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

i. Provide for modifying common application objects, such as schedules, calendars, and set points in a graphical manner, for example using a graphical slider, without requiring operator keyboard entry.

3. Application Software Features:

   a. Security:

      1) The software shall be designed so that up to 256 users of the software can each have a unique username and password. Each username/password combination shall be linked to a set of capabilities within the software, set 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. Passwords shall be changeable through on-line keyboard entry by either the individual user or the administrator.

      2) There shall be an adjustable inactivity timer that automatically logs off the current operator after the timer has expired.

      3) Record all operator inputs executed under a valid password in a data log, including operator name.

      4) At no time shall the actual password numbers be printed on the screen, except for operators with the strictest level of password, who shall be able to generate a password summary listing.

         a) The password summary shall include at least a 24-character name, login ID, password, time out value, and security level.

      5) Passwords shall be exactly the same for all operator devices, including stationary or portable OWS, or panel mounted network terminals. Any additions or changes made to password definition shall automatically cause passwords at all EMCS panels on a network to be updated and downloaded to minimize the task of maintaining system security. Users shall not be required to update passwords for EMCS panels individually.

      6) Operators will be able to perform only those commands available for their respective passwords. Menu selection displayed at any operator device, including portable or panel mounted devices, shall be limited to only those defined for the access level of the password used to log on.

      7) Provide user definable, adjustable, automatic log off timer to activate after from 1 to 60 minutes of inactivity (adj.), to prevent operators from inadvertently leaving devices online.

   b. I/O capability from each OWS

   c. Automatic system diagnostics; monitor system and report failures.

   d. Database creation and support.

   e. Automatic and manual database save and restore.

f. Object and property status and control.

g. Automatic restart of field equipment on restoration of power.

h. Custom report development.

i. Utility and weather reports.

j. Workstation application editors for controllers and schedules.

k. Maintenance management.

l. Trend logs: Support customized trend log reports with variables assignable at the OWS, automatic archive of trended values, with data retrievable in spreadsheets and database programs.

m. Data collection, reports, and logs. Include standard reports for the following:

1) Current values of all objects.
2) Current alarm summary, sorted by priority.
3) Alarm history.
4) Disabled objects.
5) Alarm lockout objects.
6) Logs.

n. Summaries:

1) System log shall log the status of points within system.
2) Alarm summary shall log specified alarm points which are actually in alarm.
3) Off-normal summary shall log points specified by the operator to be in the off-normal mode.
4) Lockout summary shall log points specified to be in the lockout condition.

o. Messages:

1) The system shall support a minimum of 500 different automatic messages defined by the authorized operator on-line via word processing editor with minimum available length of 256 alpha-numeric characters. Messages shall also indicate whether acknowledgment is necessary.

2) Messages may be assignable as pop-up reactions to operator inputs, system alarms, event processes, and other system messages as required and deemed useful by the programmer, Engineer, and Owner.

p. Totalization:

1) The energy management system shall allow for analog or digital point totalization with respect to time.

2) Run time totalization shall be provided to track the run time of point assigned. A summary shall be generatable listing run time points and their present values.

3) Analog totalization shall be provided to measure analog data over real time span. A summary shall be generatable which lists analog totalization points and their current period values, current dry values, previous period and previous day totalized values.

4) Provide customized totalization reports for each major HVAC system.

q. Scheduling:

1) The system shall be capable of initiating equipment based on a preselected time-of-day schedule. This program shall provide scheduling for seven days of the week with 500 unique schedules. The user shall not be required to enter control programs to alter time-of-day schedules.

2) Provisions shall be made to program in holidays up to one year in advance; up to 366 consecutive holidays shall be enterable.

3) On-Line Graphic Generation:

4) This program shall allow the operator to generate color graphics on-line using symbols selected from a standard library of symbols.

4. Energy Management Features: The following energy management programs shall reside in the OWS for global control purposes:

a. Duty cycling program shall periodically turn selected loads off to reduce energy consumption.

b. Optimal run time program shall control the start-up and shutdown of HVAC equipment based on the most energy efficient schedule. Startup shall be staggered to minimize inrush currents.

c. The energy management program shall not allow the energy management features listed above to shut down air systems (air handling units, unit ventilators, cabinet heaters, etc.) which are providing ventilation air to the occupied spaces during the occupied cycle.

d. Programs shall be supervised by an energy management program, which shall oversee the execution of global energy management functions. These programs may also reside in individual field panels on systems of this architecture. If the host computer is to act only in a supervisory mode, specific panels shall be assigned to global function duty.

5. Custom Application Software:

a. English language oriented.
b. Full-screen character editor/programming environment.
c. Allow development of independently executing program modules with debugging/simulation capability.
d. Support conditional statements.

e. Support floating-point arithmetic with mathematic functions.
f. Contains predefined time variables.

6. Control Programming: Definition of operator device characteristics, EMCS panels, individual points, application, and control sequences shall be performed through fill-in-the-blank templates and a graphical programming approach. Allow the user to define the software configuration of EMCS panel logic for HVAC system control sequences, fan interlocks, pump interlocks, PID control loops, and other control relationships through the creation of graphical logic flow diagrams.

   a. Graphical Programming: Control sequences are created by using a mouse input device to draw interconnecting lines between symbols and depicting inputs, operators (comparisons and mathematical calculations), and outputs of a control sequence. As a minimum, graphic symbols shall be used to represent:

      1) Process inputs, such as temperature, humidity, or pressure values, status, time, date, or any other measured or calculated system data.
      2) Mathematical process operators, such as addition, subtraction, multiplication, or greater than, equal to, or less than, etc.
      3) Logical process operators such as IF, AND, OR, ELSE, GO TO, Exclusive OR, NOT, etc.
      4) Time delays.
      5) Process control outputs such as start/stop control points, analog adjust points, etc.
      6) Process calculation outputs.
      7) Text file outputs and advisories.

   b. Network-wide Strategy Development: Inputs and outputs for any process shall not be restricted to a single EMCS panel, but shall be able to include data from any and all other EMCS panels to allow the development of network wide control strategies. Processes shall also allow the operator to use the results of one process as the input to any number of other processes (cascading).

   c. Sequence testing and simulations: Provide a software tool which allows a user to simulate control sequence execution to test strategies before they are actually applied to mechanical systems. Users shall be able to enter hypothetical input data and verify desired control response and calculation results via graphical displays and hard copy printouts.

7. Dynamic Color Graphic Displays:

   a. Provide graphics generation software to allow the user to add, modify, or delete system graphic displays that include any manipulated point data from any networked EMCS panels, including SCUs or Ucs. Develop graphic screens using any drawing package capable of generating a GIF, BMP, or JPG file format, including AutoCadd and Visio. Use of proprietary graphic file formats shall not be acceptable. In addition to a graphic background, support the use of scanned pictures.

   b. Provide for simultaneous viewing of several graphics at the same time (windowing) to analyze total building operation, or to allow display of a graphic associated with an alarm to be viewed without interrupting work in progress.

c. Provide libraries of pre engineered screens and symbols depicting standard air handling unit components (e.g. fans, cooling coils, filters, dampers, etc.), complete mechanical systems (e.g. constant volume terminal reheat, VAV, etc.) and electrical symbols.

d. The graphic development package shall use a mouse or similar pointing device in conjunction with a drawing program to allow the user to perform the following:

1) Define symbols.
2) Position and size symbols.
3) Define background screens.
4) Define connecting lines and curves.
5) Locate, orient, and size descriptive text.
6) Define and display colors for all elements.
7) Establish correlation between symbols or text and associates system points or other displays.

e. Each graphic display shall consist of a static section and a dynamic section. The static section shall consist of elements which usually do not change with time or point condition. The dynamic section shall consist of elements which usually do change with point conditions, and shall be integrated with the respective static section, appearing in appropriate locations in it.

1) A minimum capability of 256 different static sections shall be provided. Each static section shall be capable of being associated with any number of dynamic sections. The elements of a static section shall be capable of outputting in any one of eight different colors. A static section does not have to be associated with a dynamic section to be used as chromatic output. The elements of static sections shall include, but not be limited to: lines, line drawings, symbols, and character strings (single/double sized).

2) The dynamic section shall accommodate a minimum of 40 elements. The elements of a dynamic section shall be capable of outputting in any one of the eight colors. Symbols shall be a pictorial illustration of the point condition. This illustration shall not be dependent on the type of sensor/device being represented. The elements of a dynamic section shall include, but not be limited to: point identifier, point expanded identifier (if abbreviated), analog value, engineering units, mode units, symbols, lines, text strings. Dynamic temperature values, humidity values, flow values, and status indication shall be shown in their actual respective locations, and shall automatically update to represent current conditions without operator intervention.

3) System graphic display shall update the dynamic elements to the current point condition, at least every 30 seconds. System shall include a list of standard symbols. Lines shall include, but not be limited to: vertical, horizontal, diagonal, curved. Character strings shall include alpha/numeric characters and shall be capable of 60 characters minimum length.

4) Dynamic element shall be capable of being used a multitude of times on a single chromatic display and shall be stored in a symbols library program.

f. When a point is in alarm on the screen, the OWS shall be able to display an alarm graphic with a minimum number of keystrokes. Alarm graphic individual point information shall include, but not be limited to: point identification, point location, alarm point value, alarm limit value, engineering units (°F, KWH, etc.), mode units (on/off, alarm).

8. Web Browser Features:

a. On-Line Help: Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.

b. Security: Each operator shall be required to log on to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.

c. System Diagnostics: The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

d. Alarm Console:

1) The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.

2) When the Alarm Console is enabled, a separate alarm notification window will supercede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

9. Web Browser Clients

a. The system shall be capable of supporting at least 64 clients using a standard Web browser such as Internet Explorer or Netscape Navigator. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, are only acceptable if 64 licensed copies of the client machine software are provided, installed, and tested. The system shall support a minimum of ten (10) simultaneous clients.

b. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the EMCS, shall only be acceptable if 64 workstation or workstation hardware upgrades are provided.

c. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

d. The Web browser client shall support at a minimum, the following functions:

1) User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.

2) Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.

3) HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.

4) Storage of the graphical screens shall be in the Building Control Units (BC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.

5) Real-time values displayed on a Web page shall update automatically without requiring a manual “refresh” of the Web page.

6) Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:

a) Modify common application objects, such as schedules, calendars, and set points in a graphical manner.

b) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.

c) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

d) Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

e) View logs and charts

f) View and acknowledge alarms

7) The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

8) Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.4 NETWORK CONTROL UNITS (NCUs)

A. General: Network Control Units shall be microprocessor based, multi-tasking, multi-user, and employ a real time operating system. Each NCU control panel shall consist of modular hardware including power supply, CPU board, and input/output modules. A sufficient number of NCUs shall be supplied to fully meet the requirements of this specification and the controls requirements shown on the drawings.

1. Basis of design NCUs: Schneider Electric Continuum bCX1-CR-xxx with InfbCX1 controller.

B. Webserver Functionality: All NCUs shall reside directly on the Owner's Ethernet TCP/IP LAN/WAN and shall be capable, out-of-the box, to be set up as a Web Server. The NCU shall have the ability to store HTML code and "serve" pages to a web browser. Provides the ability for any computing device utilizing a TCP/IP Ethernet connection and capable of running a standard Internet browser (Microsoft Internet Explorer™, Netscape Navigator™, etc.) to access real-time data from the entire BAS via any NCU.

1. Graphics and text-based web pages shall be constructed using standard HTML code. The interface shall allow the user to choose any of the standard text or graphics-based HTML editors for page creation. It shall also allow the operator to generate custom graphical pages and forms.

2. The WEB server interface shall be capable of password security, including validation of the requesting PC's IP address. The WEB server interface shall allow the sharing of data or information between any controller, process, or network interface (BACnet, LonTalk and TCP/IP) that the BMS has knowledge of, regardless of where the point is connected on the BAS network or where it is acquired from.

3. The BAS network controller must act directly as the WEB server. It must directly generate HTML code to the requesting user (i.e. WEB browser), eliminating the need for and reliance on any PC-based WEB server hardware or software. To simplify graphic image space allocation, HTML graphic images, if desired, shall be stored in any shared network device. The BAS Web server shall have the ability to acquire any necessary graphics using standard pathing syntax within the HTML code mounted within the BAS WEB server. External WEB server hardware and software are not acceptable.

C. Hardware Specifications

1. Memory: A minimum of 4MB of RAM shall be provided for NCUs with expansion up to 8MB. The 8MB versions shall include a floating-point math co-processor.

2. Communication Ports: Each NCU shall provide communication to both the Workstation(s) and the field buses. In addition, each NCU shall have at least three other communications ports that support a telephone modem, portable service tool, serial printer and connection to third party controllers such as a chiller control panel. On a LAN/WAN system, the NCU shall be provided with a 10Mbps plug-in Ethernet TCP/IP network interface card (NIC).

3. Input/Output (I/O): Each NCU shall support the addition of the following types of inputs and outputs:

    a. Digital Inputs for status/alarm contacts.
    b. Counter Inputs for summing pulses from meters.
    c. Thermistor inputs for measuring temperatures in space, ducts and thermowells.
    d. Analog inputs for pressure, humidity, flow and position measurements.
    e. Digital Outputs for on/off equipment control.
    f. Analog Outputs for valve and damper position control, and capacity control of primary equipment.

4. Modular Expandability: 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 or DIN-mountable IOU modules. It shall be possible to combine I/O modules as desired to meet the I/O requirements for individual control applications.

5. Real Time Clock (RTC): Each NCU 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. In normal operation, the system clock shall be based on the frequency of the AC power. The system shall automatically correct for daylight savings time and leap years and be Year 2000 compliant.

6. Power Supply: The power supply for the NCUs shall be auto sensing, 120-220VAC, 60/50 Hz 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. Optionally, if indicated on the drawings, the power supply shall accept an input voltage of (–48 VDC).

7. Automatic Restart After Power Failure: Upon restoration of power after an outage, the NCU 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.

8. Battery backup: Each NCU with the standard 120-220VAC power supply shall include a programmable DC power backup system rated for a minimum of 72 hours of battery backup to maintain all volatile memory or, a minimum of 2 hours of full UPS including modem power. This power backup system shall be configurable such that at the end of a settable timeframe (such as 1 hour) of running on full UPS, the unit shall shut off full UPS and switch to memory retention-only mode for the remainder of the battery power. The system shall allow the simple addition of more batteries to extend the above minimum battery backup times.

D. Software Specifications

1. General: The NCU shall contain flash ROM as the resident operating system. Application software shall be RAM resident. Application software shall only be limited by the amount of RAM memory. There shall be no restrictions placed on the type of application programs in the system. Each NCU 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: 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.

E. Control Software:

1. The NCU shall have the ability to perform the following pre-tested control algorithms:

   a. Proportional, Integral plus Derivative Control (PID)
   b. Two Position Control
   c. Digital Filter
   d. Ratio Calculator
   e. Equipment Cycling Protection

2. Mathematical Functions: 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 shall be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.

3. Energy Management Applications: NCUs shall have the ability to perform any or all of the following energy management routines:

   a. Time of Day Scheduling
   b. Calendar Based Scheduling

c. Holiday Scheduling
d. Temporary Schedule Overrides
e. Optimal Start
f. Optimal Stop
g. Night Setback Control
h. Enthalpy Switchover (Economizer)
i. Temperature Compensated Duty Cycling
j. CFM Tracking
k. Heating/Cooling Interlock
l. Hot/Cold Deck Reset
m. Free Cooling
n. Hot Water Reset
o. Chilled Water Reset
p. Condenser Water Reset
q. Chiller Sequencing

4. History Logging: Each controller shall be capable of logging any system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system variables (inputs, outputs, math calculations, flags, etc.) can be logged in history. A maximum of 32,767 values can be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logs can be automatic or manual. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.

5. Alarm Management: For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms shall be tested each scan of the NCU and can result in the display of one or more alarm messages or reports.

6. Up to 8 alarms can be configured for each point in the controller.

   a. Messages and reports can be sent to a local terminal, to the front-end workstation(s), or via modem to a remote-computing device.

   b. Alarms shall be generated based on their priority. A minimum of 255 priority levels shall be provided.

   c. If communication with the Operator Workstation is temporarily interrupted, the alarm shall be buffered in the NCU. When communications return, the alarm shall be transmitted to the Operator Workstation if the point is still in the alarm condition.

7. Reporting: The NCU shall be able to generate user-definable reports to a locally connected printer or terminal. The reports shall contain any combination of text and system variables. Report templates shall be able to be created by users in a word processing environment. Reports can be displayed based on any logical condition or through a user command.

2.5 STANDALONE CONTROL UNIT (SCU) PANEL

A. SCUs shall be microprocessor based, multi-tasking, multi-user, real-time digital control processors designed to integrate multiple Unitary Controllers, provide central processing capacity and integration of distributed processing, and interface directly with the system OWS and LAN.

B. Each SCU panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules. A sufficient number of controllers shall be supplied to fully meet the requirements of this specification.

C. The basic elements of the direct digital control system structure shall consist of standard components kept in inventory by the equipment supplier. The components shall not require customizing other than setting jumpers and switches, adding firmware modules or software programming to perform required functions.

D. The system shall be capable of being expanded to its full capacity by adding sensors and entering programs in available random access memory (RAM). Future expansion shall not require hardware modifications to the controller.

E. SCU shall be listed in accordance with UL 864 as required to provide direct control of all smoke dampers.

F. Memory: Provide with sufficient memory to meet system performance requirements and support its own operating system, database system, and database including:

1. Control processes
2. Energy management applications
3. Alarm management
4. Historical/trend data for all points
5. Maintenance support applications
6. Custom processors
7. Operator I/O
8. Dial-up communications
9. Manual override monitoring

G. Point Types: Support the following types of point inputs and outputs:

1. Digital inputs for status/alarm contacts
2. Digital output for on/off requirement control
3. Analog inputs for temperature, pressure, humidity, flow and position measurements.
4. Analog outputs for valve and damper position control, and capacity control of primary equipment.
5. Pulse inputs of pulsed contact monitoring.

H. Expandability:

1. The system shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, field controllers, sensors, and actuators.

2. The system architecture shall support expansion capacity of all type of SCU panels, and all point types included in the initial installation.

I. Serial Communication Ports: Provide at least two RS-232C serial data communication ports for simultaneous operation of multiple operator I/O devices such a industry standard printers, laptop workstations, PC workstations, and panel mounted or portable Operator's Terminals. SCU panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers, or network terminals.

J. Hardware Override Switches:

1. Provide the ability to manually override automatically executed commands at the SCUs via local, point discrete, onboard hand/off/auto operator override control via local keypad function for binary control points and with modulating control for analog control type points.

K. Hardware Override Monitoring:

1. SCU panel shall monitor the status or position of all override, and include this information in logs and summaries to inform the operator that automatic control has been inhibited. EMCS panel shall also collect override activity information for daily and monthly reports.

L. Local Status Indicator Lamps:

1. The SCU panel shall provide local status indication for each binary input and output for content, up-to-date verification of all point conditions without the need for an operator I/O device.

M. Integrated On-Line Diagnostics:

1. Each SCU panel shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all subsidiary equipment. The SCU panel shall provide both local and remote annunciation of any detected component failures, or repeated failure to establish communication. Indication of the diagnostic results shall be provided at each SCU panel, and shall not require the connection of an operator I/O device.

N. Sure and Transient Protection:

1. Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induces voltage transient consistent with IEEE Standard 587-1980. Isolation levels shall be sufficiently high as to allow all single wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.

O. Power failure:

1. In the event of the loss of normal power, there shall be an orderly shutdown of all SCU panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.

2. Upon restoration of normal power, the SCU panel shall automatically resume full operation without manual intervention.

P. No digital control panel shall be loaded to more than 80% of its total available point capacity of the digital/analog/input/output sections.

Q. The SCU shall perform its assigned control and energy management functions as a stand-alone unit. Stand-alone control shall include, but not be limited to:

1. Supply and/or water reset.
2. Adaptive optimal start.
3. Time of day start/stop.
4. Zero energy band.
5. Night purge/warm-up.
6. Duty cycle.
7. Control valve, damper, motor and alarm capabilities.

R. EMCS Shall Operate Within The Following Limits:

1. Temperature 32°F to 120°F.
2. Humidity 0 to 95% RH.
3. Voltage +/- 10%.

S. Control algorithms shall be available and resident in the EMCS to permit proportional, integral, derivative, incremental, floating and two position control modes in combination to meet the need of the application and to adapt to job conditions.

T. Control shall be performed in a digital manner using the digital signal from the microprocessor based controller converted through electronic circuitry for modulation of electric or pneumatic actuators. This may take the form of a pulse width modulated signal or a true analog signal generated through a D/A convertor. Electro-pneumatic transducers used for pneumatic outputs shall be cabinet mounted either within the controller or in separate cabinet located immediately next to the digital control panel.

U. Adjustments of control variables shall be available at the controller with the modem through a non-intelligent terminal. Hand held or mounted in cabinet face. If hand held devices are provided two shall be furnished. These adjustments shall include, but not be limited to, setpoints, proportional gain, integral rates, the velocity and acceleration constants associated with incremental control and on/off values of two-position control.

V. The controller shall contain necessary mathematic, logic, utility functions, all standard energy calculations and control functions in ROM. These should be available in combination for programming the unit. These routines shall include, but not be limited to:

1. Math routines:

a. Basic arithmetic.
b. Binary logic.
c. Relational logic.
d. Fixed formulas for psychrometry.
e. Calculations.

2. Utility routines for:

    a. Process entry and exit.
    b. Keyboard functions.
    c. Variable adjustments and output.
    d. Alarm indication.
    e. Restart.

3. Control routines for:

    a. Signal compensation.
    b. Loop control.
    c. Energy conservation.
    d. Timed programming.

W. Final field programs shall be stored in battery backed up RAM. The EMCS (SCUs, UCs, etc.) shall be supplied with a minimum of eight hours of battery backup for the RAM with an automatic battery charger.

X. The EMCS shall be expandable by adding additional SCUs, UCs, etc., that operate through the processor of the EMCS.

Y. Provide digital sensors, differential air and/or water flow switches, space temperature sensors (30°F to 90°F), outside and air temperature sensors (-30°F to 120°F), hot water temperature sensor (0°F to 300°F), chilled water sensors (30°F to 90°F), humidity sensors, static pressure sensors, and other sensors and switches required to perform functions as specified.

Z. Provide transducers, EP switches, devices, required by the EMCS to position the control elements.

AA. Provide electric and pneumatic interface devices.

BB. The EMCS software shall contain a self-test procedure for checking the annunciator lights on the digital display, and the computer.

CC. Variable shall be identified as being reliable or unreliable. When a calculation is required to use a value (sensed or calculated), which is identified as being unreliable, the unreliable data value will flash. The calculation will use a default value programmed into the unit.

DD. Alarms (e.g. a pump that did not start) and deviation alarms (e.g. temperature out of limits) will be annunciated.

EE. The SCUs, UCs, shall be enclosed in a metal cabinet. The cabinet shall be constructed such that it can be mounted and electrical terminations made during the construction phase of the project.

FF. The EMCS cabinet shall be a hinged metal type with a baked enamel finish and provided with a key lock. Cabinets on each installation shall utilize one master key. Control wiring and system communications shall be electrically terminated inside the EMCS on a suitable termination board.

2.6 CONTROL UNITS

A. Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.

B. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.

C. Stand-alone mode control functions operate regardless of network status. Functions include the following:

1. Global communications.
2. Discrete/digital, analog, and pulse I/O.
3. Monitoring, controlling, or addressing data points.
4. Software applications, scheduling, and alarm processing.
5. Testing and developing control algorithms without disrupting field hardware and controlled environment.

D. Standard Application Programs:

1. Electric Control Programs: Duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, on-off control with differential sequencing, staggered start, antishort cycling, PID control, DDC with fine tuning, and trend logging.

2. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy switchover.

3. Chiller Control Programs: Control function of condenser-water reset, chilled-water reset, and equipment sequencing.

4. Programming Application Features: Include trend point; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run-time totalization; and security access.

5. Remote communications.

6. Maintenance management.

7. Units of Measure: Inch-pound and SI (metric).

E. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.

F. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

2.7 LOCAL CONTROL UNITS

A. Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.

B. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.

C. Stand-alone mode control functions operate regardless of network status. Functions include the following

1. Global communications.
2. Discrete/digital, analog, and pulse I/O.
3. Monitoring, controlling, or addressing data points.

D. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.

E. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

2.8 I/O INTERFACE

A. Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.
B. Binary Inputs: Allow monitoring of on-off signals without external power.
C. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
D. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
E. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation.
F. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).
G. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
H. Universal I/Os: Provide software selectable binary or analog outputs.

2.9 POWER SUPPLIES

A. Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.
2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

B. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.
2. Maximum response time of 10 nanoseconds.

3. Minimum transverse-mode noise attenuation of 65 dB.
4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.10 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.

2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.

3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.

4. Enclosure: Dustproof rated for operation at 32 to 120 deg F.

2.11 ANALOG CONTROLLERS

A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.

B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F, and single- or double-pole contacts.

C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.

1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.

2.12 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Current Transducer:

1. Solid or split core self powered analog current transducer slips over power wiring to provide combination load status and power use trending data.

    a. Linear output from 0 to full scale.
    b. 0-5Vdc output.
    c. Operating conditions: -15-60 deg C, 0-95%rh.
    d. 2 second response time.
    e. Use solid core for new applications, split core for retrofits away from terminals.
    f. Split core +/- 2% of full scale accuracy from 10% to 100%.
    g. Solid core +/- 2% of reading accuracy from 10% to 100%.
    h. Similar to Hawkeye 722, 922/932, size and range as required for load.

C. Status Sensors:

1. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

D. Static Pressure Transmitter / Transducer:

1. Senses differential gauge (static) pressures and converts this pressure difference to a proportional analog output signal.

    a. Variable capacitance type, with stainless steel diaphragm and insulated positioning electrode.
    b. Voltage Requirement (input): +/- 12 V DC.
    c. Output: linear, 4 to 20 mA or 0 - 5 V DC.
    d. Pressure ranges 0 to 0.1 in w.g. through 0 to 25.0 in. w.g.
    e. Over Pressure Protection: Minimum 10 x full scale.
    f. Pressure Part Volumes: Positive part - 0.020 $in.^3$; reference part - 2.0 $in.^3$
    g. Accuracy: +/- 1% full scale (includes non-linearity hysteresis and non-repeatability).
    h. Factory calibrated with zero span adjustment capability.
    i. Temperature compensated output over the entire operating temperature range.
    j. Operating Environments: 40 deg. F to 100 deg. F.

E. Electronic Humidity Transmitter.

1. The electronic duct humidity transmitter shall sense duct humidity and shall transmit an electrical signal to the EMCS. A direct acting, proportional relationship shall be developed between the measured relative humidity and the transmitter output voltage,

2. Relative humidity shall be sensed by a cellulose acetate butyrate element and conveyed to a linear variable differential transformer. Changes in percent RH shall reposition the transformer core and create an imbalance in the secondary windings proportional to the magnitude of the RH sensed by the transmitter. The transmitter requires a +12 or +15 volt DC power supply. For a 10 to 100% RH input, the output shall be 0.5 to 5 volts with a +12 volt supply and 20 to 200 mV with a +15 volt supply. Change from one output range to the other shall be possible with a jumper.

3. The transmitter shall be provided with all electrical steel enclosure and cover; the element shall be protected with an aluminum guard.

    a. Action: Direct Acting, Proportional.
    b. Element: Cellulose Acetate; Butyrate-CAB.
    c. Operating Range: 10 to 100% RH.
    d. Supply Voltage: +12 volts DC, 60 mW (max.) or +15 volts supply -20 to 20 mV DC with a 15 volt supply.
    e. Output Signal: 0.5 to 5.0 volts DC with a 12 volt supply -20 to 20 Mv DC with a 15 volt supply.
    f. Load Resistance: 10k ohms with 0.5 to 5 volt output; 100k ohms with 20 to 200 Mv output.
    g. Accuracy: $\pm$ 2% of full scale (or RH) between 20 and 75% RH (includes non-linearity, hysteresis, and repeatability).
    h. Operating Environment: 40 to 125E F, 10 to 90% RH, non-condensing.

F. Temperature Sensors:

1. Temperature sensors shall be:

    a. Platinum wound RTD Type $\pm$ 1°F. Factory calibration point - 70°F at 1000 OHMS or 0°C at 1000 OHMS. Adjustments for zero and span. Output 4-20 mA.

Or (for non averaging sensors)

    b. Contractor may use thermistors which are compatible with system as follows:

        1) Accurate to 0.35°F over a range of -40° to 240°F,
        2) Noncalibrated devices, accuracy traceable to NBS testing,
        3) Guaranteed stability of 0.2°F over a 15 year period,
        4) Interchangable with any other in the new system, and
        5) Shielded cable not require for the guaranteed performance.

2. Room element assemblies shall be located in conditions representative of the zone, on an interior wall where air is free to circulate around the element but away from non-representative air conditions such as drafts or heat radiation. Mount the assembly 5 feet above the floor on a standard electrical wallbox, or as otherwise directed or required to obtain satisfactory results. A mounting bracket, wallplate, decorative cover and tamper resistant screens shall be furnished with the assembly. May be S.S. wall plate type where applicable.

3. Outside air temperature sensing: The outside air sensor shall be mounted where the effects of sunlight and radiant heat are at a minimum (north wall) for true “dry-bulb” reading. Provide in enclosure to fit 1/2" threaded rigid conduit, designed for exterior dry-bulb sensing. Seal off fittings shall be used to prevent condensation on the element in the housing. Monitoring range to suit controls.

4. Duct temperature sensors: Duct insertion sensors for fan discharge and other thoroughly mixed applications designed for control and/or indication shall have a single sensor with an accuracy of 0.25% of scale range. Provide averaging type sensing elements for transmitters and capillary thermostats in mixed air and coil discharge applications to counteract effects of stratification. Length as required to provide at least four full passes across the duct – two long dimension and two diagonal. Capillary systems to be fully compensated. The element shall consist of nickel wire encased in a copper tube. Monitoring range to suit controls.

5. Liquid temperature sensors shall be mounted in separable brass immersion wells with 1/2" - 14 NPT threads, filled with "Insulgrease" or other approved heat transfer compound. Monitoring range to suit conditions. Well and spring loading device to assure RTD contact with end of sensing well. Whenever a sensing element and well are installed in a chilled water line, plumber's putty or some other suitable sealant shall be applied around the adapter as well as the point where the two sensors leads pass through the adapter. This is to prevent condensation of moisture in the well and failure of the element. Minimum well length to be equal to 1/2 of the pipe diameter; match bulb length to well length.

6. Battery powered “wireless communicating” sensors which use batteries as the source of power for transmission and communication of data are not acceptable.

2.13 HVAC PROCESS FLOW CONTROL COMPONENTS

A. Automatic Air Dampers (AAD on drawings):

1. Provide all automatic dampers except those specified as being furnished by equipment manufacturer. Automatic dampers are required at all exterior wall and roof openings serving a HVAC purpose which are provided or modified as a part of this project, whether or not called for on the drawings. Control dampers to operate with sequence described later or as directed.

2. Size dampers at full duct or damper size indicated on the drawings, arranged for flanged to duct rather than inserted in duct installation (clear damper opening, not outside of frame, equal to duct size indicated). If neither duct or damper size is indicated; size for maximum velocity of 1500 fpm and maximum pressure drop including transitions to and from duct 0.05 in w.g.

3. Materials:

   a. General-service dampers not covered by the below restrictions, in galvanized steel ductwork, may be of galvanized steel construction.
   b. Dampers in aluminum ductwork: aluminum or stainless steel.
   c. Dampers subject to corrosive fumes: stainless steel of a type resistant to the fumes.

4. Overall Construction:

   a. Damper frames fabricated of extruded aluminum sections or formed steel, with reinforced corner bracing, suitable for flange mounting to duct. Seal any and all gaps at frame joints to maintain airtight integrity of ductwork.

1) Where flanged to duct mounting is not possible due to space restrictions or where Owner prefers access from inside duct, propose slip in style dampers on a case by case basis in damper submittal along with individual rationale for frame style selection.

b. Provide extruded aluminum airfoil construction for dampers modulating outside and return airflow, isolating lead/lag blowers, those operating on systems with over 2" water column potential close off pressure, and those operating over 1500 fpm.

c. Fasten aluminum frames with approved stainless steel fasteners, separated from dissimilar metal casing by dielectric gasketing.

d. Damper blades not more than 8" in width.

e. Mount blades on electroplated square or hexagonal steel shafting operating in stainless steel, bronze, or approved polymer sleeve bearings.

f. Provide corrosion resistant linkage and actuator mounting compatible with the damper materials and service, concealed in the frame outside of the airstream for flanged to duct applications and mounted in the airstream for slip in construction.

g. Provide parallel blade operation for all two position dampers, and opposed blade operation for modulating dampers, with exception of face and bypass dampers which shall be made up of two sections of parallel blade dampers with the blades of one damper opposed to the blades of the other for proper mixing.

h. Dampers over 48 in. in length and height shall be made into multiple sections.

i. Dampers shall be capable of sequencing as required.

j. Provide AMCA Standard 511 certified class 1A leakage dampers, with maximum leakage not exceeding 3 cfm per square foot at 1 inch water gage pressure differential, or 8 cfm per square foot at 4 inches water gage pressure differential when held in the closed position with a torque of no more than 6 inch pounds per sq. ft.

k. Temperature range shall be suitable for the intended service.

5. Galvanized Formed Blade Construction Dampers:

a. Frame of 16 gauge galvanized hat shaped channel.
b. Blades of single thickness 16 gauge interlocking formed galvanized steel.
c. Neoprene blade seals, and neoprene or compressible spring steel jamb seals.
d. Design make: Arrow Series 395.

6. Extruded Aluminum Airfoil Construction Dampers:

a. Frames and airfoil blades of extruded aluminum construction.
b. Extruded polymer dampers seals with airstream inflatable double edges, mechanically locked in extruded blade slots, and easily field replaceable.

c. Blades jamb seals compressible spring stainless steel.
d. Design make: Ruskin Model CD-50 or equal.

B. Valves:

1. Valve Types:

a. Ball valves – full port for two position on/off service, with characterizing disc for modulating service.
b. Butterfly valves - two-position on/off service or for use in modulating service where specifically called out as such on drawings.
c. Globe valves - modulating service.

2. Valve Bodies:

a. Screwed bronze bodies (2" size and smaller).

b. Flanged iron bodies (larger than 2" size).

c. Ball valves shall be of two piece full port stainless steel ball and stem design similar to those described in Section 23 05 23 but with reinforced actuator duty stems, adapters, and electronic actuators.

d. Butterfly valves shall be similar to those described in Section 23 05 23 with reinforced actuator duty stems, adapters, and actuators.

e. Globe valves shall have characteristic type throttling plug, #316 stainless steel or Monel stem, and removable composition seats, tight closing to class 4 standard minimum. Provided with necessary features to operate in sequence with other valves or damper operators and adjustable throttling range.

f. Two or three way as required.

g. Designed for 125 psi operating pressure.

h. Arrange to spring return to fail-safe position as called for, quiet operating.

3. Two position valves to be full line size unless otherwise indicated. Modulating water control valves shall be sized on the basis of the smaller of 15% of the total system pressure drop or 8 ft. of water column pressure drop, based on the system design flowrates. Include valve pressure drops in submittal for review. Tag each valve before delivery to project site with scheduled valve identification for location and service.

4. Provide valves and actuation so valves fail safe in normally open or closed positions as required to provide freeze, humidity, force, temperature, etc. protection. Fail position choice shall be submitted for review.

5. Select two-way modulating valves to have equal percentage characteristics.

6. Select three-way valves to have linear characteristics.

C. Actuators:

1. Electronic Actuators:

a. Electronic actuators shall be motor driven with cast aluminum enclosure, with completely oil-immersed metal gear trains, sealed integral spiral spring return mechanism, force sensor safety stop, and shall have torque as needed to insure positive movement against system stall pressure. Furnish entire mechanism in housings designed for easy removal for service or adjustment.

b. Size each actuator motor to operate with sufficient reserve power to provide smooth modulating or 2-position action as specified.

c. Provide permanent split-capacitor, shaded pole, or synchronous motors with gear trains completely oil-immersed and sealed.

d. Equip motors for outdoor locations and for outside air intakes with "0 ring" gaskets designed to make motors completely weatherproof, and equip with internal heaters to permit normal operation at -40 deg F (-40 deg C).

e. All actuators for exterior use shall be electronic style and shall have NEMA 4 enclosures with a rain shield covering the valve stem and entire actuator housing.

f. Damper actuators shall be direct-coupled over the damper shaft, and shall be installed without connecting linkage where possible.

1) Where linkages are required, for example with multiple section dampers or dampers where actuator must be installed in the air-stream, provide with linkage furnished by the damper manufacturer and designed for the actuator being used.

g. Ball and Butterfly valve actuators shall be direct-coupled over the valve shaft, installed without connecting linkage.

1) Globe valve actuators shall have a rack and pinion linkage provided by the valve manufacturer and designed for the actuator being used.

h. The actuator shall have electronic overload and digital rotation sensing to prevent damage to the actuator through the entire rotation range of the actuator.

i. Actuators shall be capable of both clockwise and counter clockwise motion by changing mounting orientation.

j. Provide proportional actuators for modulating services that accept a 0 to 10 VDC or 4 to 20mA control input and provide a 2 to 10 VDC or a 4 to 20mA operating range. An actuator capable of accepting a pulse width modulated / floating point control signal and providing full proportional operation is only acceptable for hydronic valve services where there is no connection to outside air.

k. All 24 VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 watts for DC applications. Actuators operating on 120VAC power shall not require more than 10VA. Actuators operating on 230VAC power shall not require more than 11VA.

l. All actuators shall have an external manual gear release and actuators with more than 60 in-lb torque capacity shall have a manual crank to allow manual positioning when the actuator is not powered.

m. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation.

n. Actuators shall be provided with a conduit fitting and minimum three foot electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

o. Actuators shall be UL Standard 873 listed and CSA Class 4813 02 certified as meeting correct safety requirements.

p. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuators rated torque and shall have a minimum 2-year manufacturer's warranty, starting from the date of installation.

q. Design make: TAC-I/A *DuraDrive* series and Belimo models as required by torque.

2.14 SAFETY DEVICES

A. Low Limit: Electric type with 20' long serpentine element, coldest foot sensitivity, with automatic reset and auxiliary contacts to the EMCS. Set for 37 deg. F for "freeze" protection and 55°F for fan discharge application.

B. High Limit: Electric type, with manual reset; and auxiliary contacts to the EMCS, UL listed for fire, set for 125 deg. F.

C. Filter switches: Differential pressure type with adjustable set point, visual and audible trip indication, and auxiliary contacts to the EMCS.

2.15 MISCELLANEOUS DEVICES

A. Provide all necessary relays, controllers, accumulators, positioners, switches, solenoids, transformers, temperature sensors, and transducers for a complete system.

B. Locate these devices on local panel unless specified otherwise.

C. Wiring:

1. Controls power wiring: Provide wiring in accordance with requirements of Section 23 05 13 , Division 26, and the National Electrical Code.

2. Controls communications and data cabling:

   a. Provide plenum rated cables, in full accordance with the requirements of Divisions 26 (Electrical) and 27 (Communication).

   b. Provide cabling as recommended in writing by the controls manufacturer for optimized communications, similar to:

      1) 22AWG single twisted pair, low capacitance (12.5pF/ft), shielded or unshielded plenum rated cable for low voltage communications.
      2) 18AWG single twisted pair, low resistance (6mW/ft), shielded plenum rated cable.

3. Controls communications and data fiber optic cabling: Provide in accordance with the stricter of the requirements of Divisions 26, 27, and the written recommendations of the manufacturer of the equipment served.

4. Where additional wire to wire terminations are required beyond end device and controller termination strips, make connections using NEMA rated termination blocks with barrier isolated strip/screw or tube/screw connections, all labeled for current function. Flying splices not permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which materials and methods are to be installed and notify Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in acceptable manner.

1. Installation indicates conditions are acceptable to Contractor as required to ensure requirements for applicable warranty or guarantee can be satisfied.

2. Electrical Wiring: Check all electrical wiring associated with equipment for compliance with specifications and correctness of connections. Correct wiring in event equipment or devices fail to function in specified manner, whether due to incorrect connections or improper information and wiring diagrams.

3. Verify that conditioned power supply is available to control units and operator workstation as required.

3.2 WORK INCLUDED

A. Provide all labor, materials, equipment, and services required for the complete removal of all existing controls components being replaced or upgraded as a part of this project or which serve equipment being removed as a part of this contract.

1. Insure that controls for areas outside of this contract's work remain intact and functional. Report any existing problems with functionality before demolition. New problem areas not otherwise a part of this scope that result from this demolition work: rebuild original functionality or upgrade to be included in the new controls.

B. Provide all labor, materials, equipment, and services required for the complete EMCS installation, including Related Work, as required in the Contract Documents. Provide all programming labor required for creating the specified sequences of operation and associated graphics. Include labor required for integrating any software and programming enhancements made both during construction and commissioning and during the warrantee period. Include labor for any programming modifications required due to special circumstances not adequately described in the written sequences of operations, as required to control systems operation as intended.

C. Provide all controls wiring required to connect devices furnished as part of or adjunctive to this EMCS regardless of the source of supply. Provide connections to Owner's LAN, WAN, telephone, and internet as required to perform controls work. Coordinate all fiber optic, telecommunications, and other electrical connections with Owner.

D. Provide power wiring for controls requiring connection to AC power. Control circuits to be 120 vac maximum. Install wiring in accordance with requirements of Section 23 05 13 - Common Electrical Requirements for HVAC Equipment, Division 26, and the National Electrical Code. Provide actuator power wiring to all automatic dampers including fire/smoke dampers. Coordinate required relays, etc.. with fire alarm system control wiring by Division 28.

E. Provide all necessary devices required for proper system operation, including special electrical switches, conditioned power supplies, transformers, disconnect switches, relays, circuit breaker protection, as required.

F. Provide all controllers, actuators, sensors, etc. as specified later herein, and as required to meet the specified sequence of operation.

G. Furnish all valves, control wells, and dampers to Contractor responsible for their installation, as specified and as required to meet the sequence of operation.

H. Provide interface connections from EMCS hardware to equipment starting circuits, alarms, etc.

I. The system shall include all accessory equipment and electrical wiring to fulfill the intent of this specification, including all control and communications components required to interface with the Owner's Ethernet LAN, forming a complete and interoperable system.

J. Each portion of the District EMCS system as described above shall include all gateways, translators, interpreters, software, programming, or other accessory devices as required to achieve BACnet communications over the LAN.

3.3 INSTALLATION

A. System shall be installed and adjusted by trained mechanics and technicians, with a demonstrated experience of not less than (5) years, in the installation, adjustment, and repair of temperature control systems.

B. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

C. Connect and configure equipment and software to achieve sequence of operation specified.

D. Install labels and nameplates to identify control components according to Division 23 Section "Identification for HVAC Components."

E. Install hydronic instrument wells, valves, and other accessories according to Division 23 Section "Hydronic Piping."

3.4 SYSTEM COMPONENTS

A. Current Transducer: As required; install per manufacturer's written instructions.

B. Static Pressure Transmitter: As required; install per manufacturer's written instructions.

C. Electronic Duct Humidity Transmitter: As required; install per manufacturer's written instructions.

D. Temperature Sensors: Install per manufacturer's written instructions, in locations representative of the controlled spaces' temperature as required for proper control. Include proposed sensor locations in wiring diagram submittal.

1. Provide room temperature sensors for all spaces where thermostats are not specifically called for, as required to properly and individually control all building mechanical HVAC and domestic hot water equipment in accordance with the sequence of operation. For large spaces, provide at least one room sensor per 2000 square feet, in locations representative of the room's various exposures and internal loads.

2. Temperature Sensor with Guard: Provide sensor with guard (preferably S.S. wall plate sensor) wherever temperature sensor is called for in publicly accessed spaces similar to corridors, vestibules, lobbies, stairwells, cafeteria, gymnasium, auditorium, etc.

3. Duct and pipe temperature sensors: Provide as shown on the controls schematics and as required to properly control per the written sequence of operations.

4. Outdoor air sensors: Provide as required to accurately sense outdoor air conditions for proper economizer control, at least five separate locations facing each of East, West, North, and South, as well as a representative rooftop location.

E. Automatic Dampers: Furnish dampers, tagged for proper location, (with multiple section damper linkages). Install per manufacturer's printed instructions. Adjust to close tightly. Allow for conduit sleeve or blank space for roof fan dampers.

F. Valves: Install with union or flanged connection. Locate close to apparatus controlled with pipe reducers and increasers located adjacent to valve. Locate, arrange, and pipe per installation diagram in an upright position (stem vertical).

G. Actuators: Install per manufacturer's printed instructions as to motor size and quantity, linkage arrangement, drive connection point. Where ducts or valves are insulated, set damper operators at least 2 in. away from equipment to allow for insulation.

H. Safety Devices:

1. Low Limit: Install on all equipment handling both water and any percentage of unheated outside air, including equipment in boiler rooms handling combustion air, serpentined on the discharge face of heating and/or cooling coils, or elsewhere as required for proper freeze protection, set at 37 deg F. Low limit trip shall report an alarm to the EMCS, which shall prevent the unit's fans from operating (not applicable to boiler burner fans), cause full flow of water in elements being protected, and fully close the outside air intake and exhaust air dampers until automatically reset (combustion air dampers shall not be closed when combustion is required for building heating). If some other sequence is required for proper freeze protection of special equipment or circumstances, provide this and detail in submittal.

2. High Limit: Install in the supply medium at the discharge of each fuel fired appliance. High limit trip shall report an alarm to the EMCS, which shall prevent the units burner from operating until manually reset.

3. Filter switches: Install across each bank of air filters in each air handling system.

I. Miscellaneous Devices: As required; install per manufacturer's written instructions.

3.5 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Install building wire and cable according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Install signal and communication cable according to Division 27 Section "Communications Horizontal Cabling."

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.6 SYSTEM SOFTWARE

A. Provide completely installed and ready for use.

B. System Configuration and Definition:

1. All temperature and equipment control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.

2. The system shall be provided complete with all equipment and documentation necessary to allow an operator to independently add, delete, or modify the following:

   a. SCUs.
   b. OWSs.
   c. UCs.
   d. Points of any type, and all associated point parameters and using constants.
   e. Alarm reporting definition for each point.
   f. Control loops.
   g. Energy management applications.
   h. Time and calendar based programming.
   i. Totalization for every point.
   j. Historical data trending for every point.
   k. Custom control processes.
   l. All graphic displays, symbols, and cross references to point data.
   m. Dial-up telecommunication definition.
   n. All operator passwords.
   o. Alarm messages.

3. System Definition/control Sequence Documentation: All portions of system definition shall be self documenting to provide hard copy printouts of all configuration and application data. Control process and EMCS control loop documentation shall be provided in logical, graphical flow diagram format to allow control sequence to be easily interpreted and modified at any time in the future.

4. Database Save/Restore/Back-Up: Back-up copies of all standalone EMCS panel databases shall be stored in at least one personal computer operator workstation, and a secure electronic copy of the original complete database setup shall be stored at the offices of the TCS, available for the Owner's use.

5. Continuous supervision of the integrity of all EMCS panel databases shall be provided. In the event that any EMCS panel on the network experiences a loss of its databases for any reason, the system shall automatically download a new copy of the respective database to restore proper operations. Database back-up/download shall occur over the local area network without operator intervention. Users shall also have the ability to manually execute downloads of any or all portions of an EMCS panel database.

3.7 SCU PANEL LOCAL OR PORTABLE OPERATOR'S TERMINALS

A. Each EMCS panel shall be capable of supporting an operator's terminal for local command entry, instantaneous and historical data display, and program additions and modifications.

1. There shall be a provision for both permanently mounting the standalone EMCS panel operator terminal, or using it as a portable hand held unit.

2. The EMCS panel operator terminal shall simultaneously display a minimum of 6 points with full English identification to allow an operator to view single screen dynamic displays depicting entire mechanical systems.

3. The operator functions provided by the EMCS panel operator terminal shall include, but not be limited to, the following:

   a. Start and stop points
   b. Modify setpoints
   c. Modify PID loop setpoints
   d. Override PID control
   e. Change time/date
   f. Add/modify start/stop weekly scheduling
   g. Add/modify setpoint weekly scheduling
   h. Enter temporary override schedules
   i. Define holiday schedules
   j. View analog limits
   k. Enter/modify analog warning limits
   l. Enter/modify analog alarm limits
   m. Enter/modify analog differentials
   n. Viewpoint history files

4. The EMCS panel operator terminal shall provide access to all real or calculated points in the controller to which it is connected, or any other controller in the network. This capability shall not be restricted to a subset of predefined "global points", but shall provide totally open exchange of data between the operator terminal and any EMCS panel in the network.

5. Operator access at all EMCS panel operator terminals shall be identical to each other, as well as identical to the PC or Laptop operator workstations. Any password changes shall automatically be downloaded to all controllers on the network.

6. The EMCS operator terminal shall provide English language prompting to eliminate the need for the user to remember command formats of point named. Prompting shall be provided consistent with a user's password clearance and the types of points being displayed, to eliminate the possibility of operator error.

7. A multifunction touch pad shall be provided for point and command selection, as well as parameter entry. To minimize the possibility of operator error, the EMCS panel operator terminal shall change the limit touch pad functions based upon an operator's password clearance, the function being performed, and types of points being displayed. Screen displays shall clearly indicate only valid touch pad functions.

8. Context Sensitive Help: On-line, interactive user's "Help" manuals and tutorials shall be provided. Based upon operator request, the "Help" function shall provide general system operating instructions and specific descriptions of commands available in the currently displayed menus.

9. Identification for all real or calculated points shall be consistent for all network devices. The same English language names used at PC workstations shall be used to access points at the EMCS panel operator's terminal to eliminate cross reference or look up tables.

10. In addition to instantaneous summaries, the EMCS panel operator's terminal shall allow a user to view a point history file for system points. Point history files shall provide a record of value of analog points over the last 24 hours, at 30 minute intervals, or a record of the last ten status changes for binary type points.

3.8 GENERAL CONTROLS SYSTEM PROGRAMMING DESCRIPTION

A. Provide color graphic floor plan displays and system schematics detailing all mechanical and electrical systems as indicated in the sequence of operations, at least one for each system and piece of mechanical equipment, including air handling systems, chilled water systems, and heating systems. Create displays to represent logical grouping of system points or calculated data based upon building function, and mechanical system points which aid the operator in the analysis of the facility. The operator shall be able to view and control these systems via graphical and text-based displays and controls.

1. Provide access to the various system schematic and floor plan graphics via any and all of mouse driven graphical penetration scheme, menu selection, “file tree” organization, or text based commands.

a. Graphical menu penetration: locate and display systems graphics via a mouse driven procedure, designed and implemented to optimize performance analysis and speed alarm recognition. Five clicks maximum from whole district map to details of critical alarm via this route.

1) Whole District Map: Include each building shown as an active link; point and click to go to building. Display any building with (Owner defined, TCS implemented) alarms present as highlighted for rapid system review and diagnosis. Include at least three levels of alarm to facilitate prioritizing; each level shall be obvious and visually distinct. The most critical alarm in any building shall define the alarm level of that entire building in this graphic.

2) Main Building Display: Include a full floor key plan of each floor, broken into areas of detailed floor plans, with similar active point/click penetration scheme and highlighted alarm areas.

3) Detailed Floor Plans: Indicate the location of mechanical equipment (boilers, chiller, air handlers, duct and reheat / VAV systems, pumps and pumping systems, metering equip. etc.) and electrical equipment (switch gear, lighting, etc.) on the detailed floor plans. Highlight any systems when in alarm. Outline limits of each control zone (typically along walls, etc..) and provide active multicolored background for each zone. Zone background color shall change with space temperature deviation from setpoint, with a minimum of 8 background colors, colors to be distinct from alarm highlight colors.

4) System Specific Graphics: Provide pictorial schematically correct representations of each and every mechanical system controlled and/or monitored. Include all associated points, digital status, analog values, appropriate and/or significant calculated values, alarms, active adjustment of all user adjustable setpoints, links to all scheduling, trend logs, sequence of operations description, associated systems schematics in appropriate locations, etc. Include plain English descriptions of each active point / link shown. Include appropriate plain English warnings for alarms. Modify as required by Owner and Engineer during system review, start-up, and commissioning.

b. Menu and text based penetration: An operator request for information about a specific system shall cause the associated graphic display to be automatically selected and output on the viewing screen. The operator request may be entered via either the graphical menu penetration procedure or via a pull down directory tree style menu system with “specific building”, “specific mechanical room”, and “specific system” levels of identification. The pull down menu system shall cause the graphical menu system to be updated.

B. Graphic Representations

1. General: The program shall allow the operator to generate color graphics on-line using standard symbols selected from a standard library of symbols.

2. Provide customized graphics with dynamic point values and set points. Graphics shall include but not be limited to:

a. Each third party microprocessor controlled system with all points available.

b. Heating Hot Water System with heat injection systems, primary hot water system, secondary hot water systems, 3-ways, 2-ways, etc.

c. Air Handling Units, air and water sides, with coil pumps, zones, etc.

d. Floor Plans - The operator interface shall allow the user to access the various graphical schematics via a graphical penetration scheme of the floor plans. Minimum breakdown shall include:

1) Whole District map, showing all buildings.
2) Key plan of each building.
3) Floor plans of each building with zoom in capability.

C. Time Schedule Programs

1. The programs for the EMS shall schedule each system's operation on an hourly basis controlled through daily, weekly and/or monthly schedules. Schedules for each individual system, room or area shall be programmed and modified by the user on a calendar-like display at the OWS.

2. The programs shall store 60 months of schedules.

3. An internal time clock shall automatically compensate for daylight savings time and calendars generated by software shall automatically compensate for leap years.

D. Trend Logs

1. Provide customized trend log reports with up to twenty variables per report for each HVAC system. Points shall be assignable at the OWS; coordinate desired points on each log with Owner during training and commissioning. Archive trended values on the system hard disk for future inquiry, with back up copies automatically prompted for and generated on removable media.

E. Alarm Points

1. All temperature inputs to the DDC system (space, return air, mixed air, discharge air, supply and return water, boiler and cooling systems) shall be alarmed at the host computer if the temperature is out of range 10 deg. F (adj.) above or below setpoint.

2. Fan status shall be monitored by analog current sensing devices or differential pressure switch. If the fan is scheduled to run and the status is not proven, an alarm condition shall be shown at the host computer.

3. Pump status shall be monitored by analog current sensing devices. If the pump is scheduled to run and the status is not proven, an alarm condition shall be shown at the host computer.

4. All alarm points of any stand alone controllers such as boiler burner controls, chiller or condensing unit controls, etc., shall be monitored.

5. For all alarms, provide appropriate text and graphical annunciation to facilitate ease of understanding of source and location of problem. Coordinate annunciation with Engineer, equipment manufacturers, and Owner’s representatives.

F. Optimum Start Program

1. The building shall initially be brought to occupied temperature through an optimal start program. This program shall gradually increase space temperature requirements over a predetermined time to not only bring the building to required temperature but also soft start building mechanical equipment.

2. Each system shall have an independent modular program.

3. The program shall minimize the total energy consumption during daily start-up of each heating/cooling system.

4. A control algorithm shall compare the outside air temperature to space temperature and historical startup data to calculate a start time for each air handling system.

5. The start time for each system shall bring its respective zone to occupied setpoint at the time of occupied mode start.

6. The optimum start program shall be adjustable to the rate structure of the local energy company.

G. Optimum Stop Program

1. Each system shall have independent modular program.
2. The program shall minimize the total energy consumption during daily shut-down of each heating/cooling system.
3. A control algorithm shall compare the outside air temperature to space temperature to calculate a stop time for each air handling system.
4. The stop time for each system shall shut-down its respective zone as early as possible without letting the temperature drift out of the specified comfort range.
5. Minimum outside air ventilation shall be maintained where required by occupied status requirements of space served.

H. Smoke Dampers And Fire/Fan Shut Down

1. When fire alarm condition is initiated, the fire alarm system shall directly cause all fans 1000 cfm and larger to shut down and shall provide a signal to the EMCS to note fire alarm condition.

2. When fire alarm condition signal is received from the fire alarm system, initiate the following sequence:

   a. Cause all building fans 1000 cfm and larger to shut down. This is in addition to the direct shutdown caused by the fire alarm system.

      1) Allow variable speed drives to ramp down and ramp up on restart.

   b. Cause all smoke dampers and fire-smoke dampers to close and remain closed for the duration of the alarm condition. Delay closing smoke dampers until associated fan system has completely stopped (10 sec. Maximum).

c. Do not permit unrelated HVAC equipment (heating valves, pumps, etc..) in building to lose control.

d. Provide separate control wiring, connections to fire alarm system, all required smoke dampers, etc.., as required to accomplish the required sequence.

e. Upon termination of the fire alarm condition as indicated by a signal from the fire alarm system, cause all automatic fire/smoke dampers to open and prove open, then return all affected fans to their normally scheduled operation using the staggered start algorithm.

I. Day/Night Setback

1. The day/night setback will consist of lowering the space heating setpoint and raising the space cooling setpoint during the unoccupied mode, thereby reducing the heating and cooling energy requirements. The occupied and unoccupied areas will be specified by the owner and will be coordinated with the control system.

J. Economizer Cooling Cycle

1. The controls shall incorporate an enthalpy logic center with outdoor and return air temperature and humidity sensors that shall maximize the use of outdoor air for cooling before the mechanical cooling is energized and during operation through comparison of outdoor and return air enthalpy as follows. Note that multiple outdoor temperature conditions will be present at different outside air intake locations, and as such a comparable number of outside air sensors are required. Some mechanical systems may share a single outdoor air enthalpy center, for example adjacent UVs each facing east, providing the outdoor air conditions can be demonstrated to be virtually identical from an energy management perspective. Provide at minimum East, West, South, North, and Rooftop outdoor air sensors.

2. When the outdoor air enthalpy is less than the return air enthalpy during cooling mode, the logic circuitry shall cause the outdoor and return air dampers to modulate to the balanced outdoor air position that satisfies the critical space temperature transmitter set point before opening the system chilled water cooling valve.

3. If the outdoor air enthalpy is less than the return air enthalpy and the critical space temperature transmitter set point cannot be satisfied with 100% outside air, then the system shall circulate 100% outside air and the cooling water valve shall modulate open to satisfy the zone temperature requirements.

4. If the enthalpy sensors indicate that the return air has lower enthalpy than the outdoor air, then the system shall revert to normal cooling mode.

5. Upon a call for cooling to maintain the night setback temperature, only the economizer mode shall be operational. The chilled water control valve shall not be opened, and upon satisfying the space temperature transmitter night setback set point, the system shall revert to the normal unoccupied mode.

K. Maintenance Management: Continuously totalize run hours for equipment controlled and/or monitored for use by the maintenance management program.

L. Equipment Scheduling

1. Equipment shall be capable of 7 days, 24 hours schedules with separate holiday hours.
2. There shall be capability for five different holiday schedules which can be selected from the occupancy schedule graphic.
3. Holidays shall be programmed so that they shall need a minimum of manual adjustment year to year and can easily be modified at front end if necessary.
4. All schedule programming shall reside in local controllers, but shall be configurable from the front end.

M. Coil Freeze Protection.

1. Heating and cooling coils and any other equipment provided as a part of this project which are circulating water (not required for glycol coils) or are otherwise subject to water freeze damage, subject to the following, that have any percentage of unheated outside air entering them, shall have coil freeze protection.

2. Mixed outside and return air and the preconditioned discharge air from air to air energy recovery units shall be considered unheated for this purpose.

3. The first stage of coil freeze protection shall incorporate analog input temperature sensing at the expected freeze location. Sensing devices may be immersion style return water temperature sensor piped as close as practical to the outlet of the coil (within the rooftop unit if applicable), surface temperature sensors on the coil surface at the expected freeze location, or other comparable devices approved as applicable to the circumstances. Include details of freeze protection scheme for all such equipment in submittal. When the sensed temperature is above 60ºF (adj.), the coil control valve shall be under space temperature control. If at any time the expected freeze location sensed temperature drops below 60ºF (adj.), the control valve shall temporarily open to raise that coil's return water temperature to above 80ºF (adj.), and the EMCS shall report an alarm to the OWS

4. The second stage of coil freeze protection shall be the low limit freeze stat air temperature sensors with the sequence defined under safeties, above.

3.9 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test each point through its full operating range to verify that safety and operating control set points are as required.
4. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
5. Test each system for compliance with sequence of operation.

6. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.

2. Check instruments for proper location and accessibility.

3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.

4. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.

5. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.

6. Check temperature instruments and material and length of sensing elements.

7. Check control valves. Verify that they are in correct direction.

8. Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.

9. Check DDC system as follows:

a. Verify that DDC controller power supply is from emergency power supply, if applicable.
b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
c. Verify that spare I/O capacity has been provided.
d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.10 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.

2. Make three-point calibration test for both linearity and accuracy for each analog instrument.

3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.

4. Control System Inputs and Outputs:

a. Check analog inputs at 0, 50, and 100 percent of span.

b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
c. Check digital inputs using jumper wire.
d. Check digital outputs using ohmmeter to test for contact making or breaking.
e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:

a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
b. Manually operate flow switches to verify that they make or break contact.

6. Pressure:

a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature:

a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
b. Calibrate temperature switches to make or break contacts.

8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.

9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.

10. Provide diagnostic and test instruments for calibration and adjustment of system.

11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

3.11 SYSTEM TESTING AND COMMISSIONING

A. Test complete control system for control device operation prior to the systems acceptance. Demonstrate complete sequence of operations to Architect’s and Owner’s representatives.

1. Verify operation of system inputs and outputs, control loops and/or software programming, timing functions, operator entered constants, facilities management functions, etc., and observe that they perform their intended functions. Generate check out data sheets for each system so verified.

2. Field verify analog input calibration, analog output operation, digital input function, digital output operation, and coordination of system inputs and outputs between system graphics and field devices for schematic accuracy. Coordinate device testing with Testing and

Balancing Agency – refer to section 23 05 93 – Testing, Adjusting, and Balancing for HVAC for additional information. Generate check list of all devices, keyed with descriptive locations and functions, along with complete calibration, testing, and coordination data, certified by Contractor and TAB agency.

3. Provide complete values and points logs, printed with hourly values for one week, demonstrating correct control functions and programming.

B. When above procedure has been completed and control systems are operating satisfactorily, produce and submit a report of entire systems performance for review, including all data described above. Submit three copies to the Architect's Representative advising them that the control system is 100% complete and operates in accordance with the Contract Documents.

3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 09 00

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and fitting materials, special-duty hydronic systems fittings, equipment, valves, and specialties, and joining methods for the following:

1. Hydronic Systems piping.
2. Make-up water piping
3. Safety and relief valve piping.
4. Blowdown and system drain piping.
5. Boiler condensate drain piping.
6. Air-vent piping.

1.3 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Steel and Copper Hydronic Piping: 125psig at 250 deg F.
2. Makeup-Water Piping: 100 psig at 150 deg F.
3. Safety-Valve-Inlet and -Outlet Piping, Vent and Drain Piping: Equal to the pressure and temperature of the piping system to which it is attached.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Above Grade Piping
2. Pipe Fittings.
3. Dielectric Fittings.
4. Air and Pressure Control.

B. Shop Drawings: Include in coordination drawings details of the piping layout showing proposed piping routing including locations of offsets, fittings, elevations with drain and vent fittings, pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Provide enlarged details of congested areas, custom anchor fabrication, and other details as required to clearly delineate the proposed construction.

Retain paragraph below if procedures for welder certification are retained in "Quality Assurance" Article.

C. Welding Quality Control Submittals

1. When welded or brazed pipe work is required or proposed as a part of this project, submit following for approval before beginning any welding or brazing work:

a. Welding and Brazing Procedure Qualification: Prepare and submit for approval welding and brazing procedure qualification specification qualifying all proposed procedures as specified in Quality Assurance below with copies of all back-up data.

b. Welders' and Brazers' Certification: Submit for approval certification that each proposed welder, welding operator, brazer, or brazing operator has been qualified in all procedures proposed for that worker as specified in Quality Assurance below with copies of all back-up data.

D. Qualification Data: For Mechanical Grooved and Pressure Sealed Joint Installers.

E. LEED Submittal:

Retain subparagraph below if low-emitting materials are required for LEED-NC Credit EQ 4.1; coordinate with requirements selected in Part 2 for solvent cements and adhesive primers.

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.

1.5 CLOSEOUT SUBMITTALS

A. Field quality-control test reports.
B. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with all applicable sections of the following:

1. ANSI / ASME B 31.9: "Building Services Piping".
2. ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
3. New York State Labor Department Industrial Code Rule No. 4 (cited as 12 NYCRR4)
4. New York State Labor Department Industrial Code Rule No. 14 (cited as 12 NYCRR14).
5. Building Code of New York State.
6. ANSI / ASHRAE 15 “Standard Safety Code for Mechanical Refrigeration”.
7. ASME label on all pressure vessels and safety valves.
8. ANSI / ASME B31 – “Code for Pressure Piping”.

B. Installer Qualifications:

1. Grooved Mechanical and Pressure Seal Joint Quality Control:

a. Installer Certification: Provide installers trained in and familiar with the installation of the mechanical joint systems, certified by the approved joint manufacturer as having been trained and qualified to join piping with manufacturer's system.

b. Single Source: Obtain mechanically joined piping system components from single approved manufacturer for each system type, grooved or pressed.

c. Proper Tools: Fabricate and install joints using the proper tools, actuators, rolls, cutters, jaws, rings, etc., as manufactured and instructed by the approved manufacturer.

d. Manufacturer's Inspection: Certify grooved system installation for compliance with manufacturer's recommendations.

C. Welded Support Work Quality Control:

1. Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Welded Piping Work Quality Control:

1. Welding and Brazing Procedure Qualifications: Qualify any welding or brazing procedure to be used on this Project in accordance with ASME "Boiler and Pressure Vessel Code", Section IX. Qualification may by made by technically competent group or agency (subject to approval) meeting the following conditions:

a. Group or agency qualifying the procedure meets all procedure qualification requirements of ASME "Boiler and Pressure Vessel Code", Section IX.

b. Contractor accepts full responsibility for procedure qualified.

c. Contractor has qualified at least one welder or welding operator using procedure qualified and provides record of qualification.

d. Contractor accepts full responsibility for qualified procedures by signing related qualification records with procedure and performance qualifications including all dates, results, and associated data.

2. Welders' and Brazers' Qualifications: Ensure that all welders, welding operators, brazers, or brazing operators employed for this project are qualified for all welding and brazing procedures, proposed as part of this Project, in accordance with ASME "Boiler and Pressure Vessel Code", Section IX. Qualification by previous employer or technically competent group or agency (subject to approval) may be acceptable if following information is included:

a. Documentation that the previous qualification was for essentially the same procedures proposed and was in full accordance with ASME "Boiler and Pressure Vessel Code", Section IX.

b. Copy of performance qualification testing record showing who qualified the worker, date of qualification, and work history record showing continuous performance to maintain qualification.

3. Weld and Braze Qualification Records: Maintain and sign certified records of approved procedures used and approved qualified workers employed for welded and brazed joints performed as a part of Contract Work. Ensure all building services piping welding and brazing work can be traced to a specific procedure and welder.

4. Inspection and Examination by Owner, Remedy by Contractor: Owner reserves right to examine, inspect, and test all piping using visual, radiographic, or other recognized testing methods to determine compliance with specified quality control requirements and requirements of applicable regulatory agencies.

   a. Cost of Owner's testing of acceptable installation provided at Owner's expense
   b. Repair piping installations not passing Owner's quality inspection testing using approved method or replace at no additional cost.
   c. Cost of initial testing of piping not conforming to specified requirements and any retesting of repairs or replacement work shall be deducted from Contract Sum.

E. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Refer to Part 3 for Piping Applications Article.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Anvil International, Inc.
2. Cerro Flow Products, Inc.
3. Mueller Industries, Inc.
4. S. P. Fittings; a division of Star Pipe Products.
5. Viega LLC
6. Victaulic Company of America.

C. Copper Tubing: ASTM B 88, Annealed or Drawn Temper, Types M, L, and K.

D. Copper Tube Fittings:

1. Solder Fittings

   a. Tees, Elbows, Reducers, Adapters: ANSI B16.22 streamlined pattern wrought copper or ANSI B16.18 cast bronze; solder end connections; ASTM B62.

b. Unions: Solder type, cast bronze, ground joint, Class 150.
c. Cast Bronze Flanges: ANSI B16.24 Class 150 solder connection flanges, raised ground face, ANSI pattern drilled and spot faced bolt holes.

2. Grooved-End Fittings and Couplings:

a. Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
b. Couplings: Rigid pattern, unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves.
c. Gaskets: Prelubricated EPDM gasket manufactured by coupling manufacturer, rated for minimum 250 deg F for use with housing, and steel bolts and nuts.

2.2 STEEL PIPE AND FITTINGS

A. Refer to Part 3 for Piping Applications Article.

B. Steel Pipe: ASTM A53-S , A53-E, or A106 Schedule 40 or 80, seamless (type S) or electric-resistance welded (type ERW), Grade B, black or ASTM A123 and A153 galvanized steel pipe, plain or threaded ends.

C. Threaded Fittings:

1. Pipe threads in accordance with ANSI/ASME B1.20.1 National Pipe Thread taper (NPT) standards.
2. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.
3. Unions: ASME B16.39 malleable iron, threaded, Class 150 or higher, ground joint bronze to iron seat.
4. Cast-Iron Fittings: ASME B16.4; Class 125 or higher.
5. Malleable-Iron Fittings: ASME B16.3, Class 150 or higher.
6. Flanges: Cast Iron ASME B16.1 Class 125 or higher, raised ground face, ANSI pattern drilled and spot faced bolt holes.

D. Welded Steel Fittings: ASTM A 234/A 234M or A106 seamless forged steel.

1. ASME/ANSI B16.9 pattern with ASME/ANSI B16.25 beveled butt weld ends, wall thickness to match adjoining pipe.

a. Long radius pattern unless space restrictions prohibit, then short radius allowed.

2. ASME B16.11 socket weld class 2000.

3. Flanges: ANSI B16.5 Class 150 or higher, butt weld neck type, raised ground face, ANSI pattern drilled and spot faced bolt holes.

4. Where branch connections are two or more sizes smaller than main size, "weldolets" or "threadolets" are acceptable.

5. Fabricate custom bend angle fittings by removing material from standard butt weld type fittings at the appropriate angle and recreating the original ASME B16.25 weld configuration chamfer.

    a. Shop or site-weld weld/groove adapter nipples to custom angle fitting where applicable to create custom angle grooved mechanical fittings.

E. Grooved Mechanical-Joint Fittings and Couplings:

1. All products – fittings, couplings, gaskets, and grooving tools - shall be manufactured by a single ISO 9001 or higher certified manufacturer.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Anvil International, Inc.
    b. Central Sprinkler Company; a division of Tyco Fire & Building Products.
    c. Victaulic Company of America.

3. Mechanical Joint Fittings: ASTM A 536, Grade 65-45-12 Ductile Iron; ASTM A 47 Grade 32510 Malleable Iron; ASTM A 53, Types E or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders designed to accept grooved end couplings. Subject to applicable fitting requirements described elsewhere in this document. Basis of Design: Victaulic.

4. Mechanical Couplings: ASTM A 536, Grade 65-45-12 ductile iron or ASTM A 47 Grade 32510 malleable iron split housing, designed for bolted assembly with full circumferential engagement of coupling into pipe end or fitting groove or alternatively to grip exterior of plain steel pipe where grooving is not possible. Coupling houses pressure responsive gasket by coupling manufacturer that forms durable pressure seal. Provide rigid type couplings for all straight runs and flexible type couplings for all branch takeoff (side of tee) and elbow fittings, unless otherwise specified or directed. Provide couplings with bolt size and strength and pressure rating not less than the listed product.

    a. Grooved End Mechanical Flexible couplings: pad to pad coupling fit with clearance to groove. Basis of Design: Victaulic Style 77.

    b. Rigid Grooved End Mechanical Couplings: full circumference coupling to groove compression contact for rigid style groove couplings. Basis of Design: Victaulic Style 07 and Style 107.

5. Pipe End Grooves: Pipes may be delivered to site full length with factory grooved ends fabricated to coupling manufacturer’s specifications or shop or site fabricated to length required using coupling manufacturer’s groove cutting or rolling tool, fabricated to coupling manufacturer’s specifications.

6. Coupling Gaskets: Synthetic rubber gasket of central cavity pressure-responsive design manufacturer rated for fluid and temperature of service, minimum 300 psig working pressure at 250 degrees F.

2.3 JOINING MATERIALS

A. Flanges:

1. Gasket Materials:

a. ASME B16.21, nonmetallic, flat, asbestos free, suitable for chemical, pressure, and thermal conditions of system.
b. 1/8-inch maximum thickness unless thickness or specific material is indicated.
c. Full or narrow face pattern to fit flanges.

2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, electroplated, unless otherwise indicated.

3. Provide dielectric kit for flanges joining dis-similar piping materials.

B. Solder Filler Metals: Use solder conforming to ASTM B 32-95; alloy grades Sn96, Sn95, Sn94, E, AM, WS; lead free alloys with maximum lead content of 0.1percent by weight, minimum solidus temperature of 430 deg. F, and approved for use with potable water. Higher lead content solder not acceptable. Include water-flushable flux according to ASTM B 813.

C. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials, designed to join dis-similar metallic piping materials with dis-similar metals separated by dielectric material in a configuration to minimize galvanic corrosion of the less noble piping material.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Products & Systems, Inc.
2. Capitol Manufacturing Company.
3. Central Plastics Company.
4. Elster-Perfection Corporation.
5. Hart Industries International, Inc.
6. Lochinvar Corporation.
7. Pipeline Seal and Insulator, Inc.
8. Precision Plumbing Products, Inc.
9. Sioux Chief Manufacturing Company, Inc.
10. Victaulic Company of America.
11. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
12. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.

C. All Materials: Suitable for system fluid, pressure, and temperature.

D. Dielectric Nipples:

1. Galvanized steel nipple with insert of noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

E. Dielectric Couplings:

1. Galvanized-steel coupling with insert of noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Unions:

1. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

G. Dielectric-Flange Kits:

1. Flange assembly kit for field assembly. Include full-face or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, steel backing washers, and appropriately sized bolts and heavy pattern nuts. Provide bolts of length as required for full engagement in nuts, of higher strength if undersized for bolt sleeves as required to maintain system working pressure.

2.5 VALVES

A. Isolation, Check, Balancing, Vent, and Drain Valves: Comply with requirements specified in Section 23 05 23 -General-Duty Valves for HVAC Piping

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 23 09 00 - Instrumentation and Control for HVAC.

C. Safety Relief Valves:

1. Designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code.

2. Valve Body: Bronze, Brass, or Cast-iron, side outlet with all wetted internal working parts made of stainless steel, brass, and elastomers with 125 PSIG working pressure and 250 deg. F maximum operating temperature. Brass valve seat with Glass and carbon-filled PTFE disc.

3. Valve Size: Compliant with Section IV of ASME Boiler and Pressure Vessel Code, selected to suit system in which installed, with operating pressure and capacity factory set at full rated capacity of system at manufacturer's suggested working pressure.

4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Amtrol, Inc.
b. Armstrong Pumps, Inc.
c. Bell & Gossett Domestic Pump; a division of ITT Industries.
d. Conbraco Industries, Inc.

e. Spence Engineering Company, Inc.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2.6 THERMAL EXPANSION AND AIR CONTROL DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett Domestic Pump; a division of ITT Industries.
4. Wessels

B. Air Separator Assemblies

1. Tangential Air Separator: Designed, constructed, and ASME stamped for 125 PSIG working pressure, 225 deg. F operating temperature minimum, and sized as noted on Drawings or, if not noted, for minimum air separation efficiency of 90 percent first pass.

a. Shell: Centrifugal flow air separation design with minimum three times nominal pipe connection diameter and welded steel construction with tangential flanged, grooved, or threaded connections, perforated air collector tube with threaded air separation fitting, blow down fitting, and hanger fittings.

b. Design Make: "Rolairtrol RL" by Bell & Gossett.

2.7 HYDRONIC PIPING ACCESSORIES

A. Pipe Sleeves:

1. Sleeve 6-Inches Diameter and Smaller: Schedule 40 galvanized, welded steel pipe, ASTM A53, Grade A.

2. Sleeves Larger than 6-inches: Galvanized sheet metal, 10 gauge, round tube with welded longitudinal joint.

3. Sleeves Installed In Masonry Or Cold Formed Metal Framing/Gypsum Board Construction: Galvanized sheet metal, 20 gauge, round tube with welded longitudinal joint.

B. Escutcheons: Chrome plated, stamped steel, hinged, split-ring escutcheons, with setscrew. Inside diameter closely fits pipe outside diameter or outside diameter of pipe insulation where piping is insulated. Outside diameter completely covers opening in floor, wall, or ceiling.

1. Manufacturer: Manufacturers offering acceptable products include Grinnell.

C. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to fill annular space continuously between pipe and sleeve. Connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

1. Manufacturer: Manufacturers offering acceptable products include Thunderline Corp.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Closed Loop Hydronic Piping, aboveground, NPS 2 and smaller:

1. Type L drawn-temper copper tubing with wrought-copper fittings, and soldered**,** or brazed joints.
2. Schedule 40 steel pipe with welded, threaded, or mechanical grooved fittings and joints.

B. Makeup-water piping installed aboveground: Type L, drawn-temper copper tubing, wrought-copper fittings, and [**soldered**] [**brazed**] [**pressure seal**] joints.

C. Category IV Boiler Vent Condensate Drain Piping: Schedule 40 CPVC plastic pipe and fittings and solvent-welded joints.

D. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

E. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

F. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

3.2 PIPING REMOVALS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of existing piping systems to be removed. Remove piping as required for neat installation of the indicated work with no extraneous pipe or fittings remaining and back to the point of continued use where reconnection is not indicated.

B. Draining:

1. Refer to section 23 01 20 for draining, filling, flushing and cleaning of existing systems.

2. Drain systems completely as required for the contract Work so as to avoid cross contamination of system’s heat transfer fluids.

3. Protect Owner’s belongings from damage during draining and removals.

4. Install additional drains if necessary to completely drain system. Note that drain valves are required on all new piping low points.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated piping locations and arrangements were used to size piping, calculate friction loss, expansion compensation, pump sizing, fill volume, and other design considerations. Install piping generally as indicated unless deviations to layout are approved on Coordination Drawings.

B. Select system components with pressure rating equal to or greater than system operating pressure.

C. Install piping in concealed locations except in equipment rooms and service areas, unless otherwise indicated on drawings: install in walls, pipe chases, utility spaces, above ceilings, etc.

D. Install piping orthogonal to building walls as possible within constraints required for sloped drainage, non-orthogonal building construction, etc. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install fittings for changes in direction and branch connections, unless otherwise specified.

F. Install piping so as to provide for positive drainage and air elimination.

1. Install straight piping free of sags and bends. Do not install bent piping – remove from site.

2. Install gravity drain lines at uniform slope down in direction of flow. Maintain maximum slope feasible up to one quarter inch rise per foot of run, but not less than 1% (approximately one eight inch per foot). Where height restrictions do not allow for minimum required slope, provide for pumped condensate removal as shown.

3. Install pressurized pumped flow piping at a uniform grade of 0.2 percent upward in direction of flow or at otherwise indicated slopes.

4. Avoid local high and low points where possible.

5. Provide eccentric pipe size reducers and increasers, installed so as to allow for both positive drainage and air elimination. In general, where piping is sloped up in direction of flow, reduce pipe sizes with level side up and increase pipe sizes with level side down.

G. Install piping allowing for proper servicing of hydronic systems.

1. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

2. Install piping and specialties with sufficient clearance to allow application of specified insulation.

3. Install valves with sufficient clearance and orientation to permit both ease of operation and servicing.

4. Install dis-assemble able unions, flanges, or mechanical joints on equipment side of isolation valve**,** as required to remove and service all serviceable components without system drain-down or cutting piping. Install unions and flanges in piping,.

   a. Provide unions for NPS 2 and smaller, flanges for NPS 2-1/2" and larger.

   b. Install adjacent to control valves, at final connections of equipment, as required to adjust threaded pipe joints after fixed (non-rotatable) joints are made, and elsewhere as indicated.

   c. Install out of the line of coil pull, tube bundle removal access space, etc.

   d. Install so sensor wires, thermometers, gauges, etc., need not be rotated, removed, or disconnected to service equipment.

   e. Install within two feet of control valves with no elbows between valve and union as required for ease of replacement.

   f. One dis-assemble able fitting may be used for two components (ex., both control valve and equipment service) if they are separated by no soldered, brazed, or welded elbows and no more than three feet of pipe.

H. Identify piping as specified in Section 23 05 53 - Identification for HVAC Components.

I. Install sleeves for piping penetrations of walls, ceilings, and floors.

J. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors.

K. Install sleeve seals for piping penetrations of concrete walls and slabs.

3.4 PIPE JOINT CONSTRUCTION

A. General Pipe Joint Construction:

1. Cut all pipe ends square.
2. Ream ends of pipes and tubes removing burrs past original pipe wall to restore full pipe ID.
3. Remove scale, slag, dirt, and debris from both inside and outside of piping and fittings before assembly.
4. Remake leaking joints using new materials.

B. Threaded Joints:

1. Provide threaded pipe ends in conformance with ANSI B1.20.1, tapered pipe thread standards

2. Cut threads full and clean using sharp cutting oil flooded dies.

3. Note internal length of threads in fittings or valve ends and proximity of internal seat or wall to determine pipe threading and align threads at point of assembly.

4. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified) and assemble joint “wrench-tight” with paired wrenches, one wrench on adjacent pipe and one wrench on valve end where pipe is threaded.

5. Damaged Threads: Do not use pipe or fittings with torn, corroded or damaged threads.

6. Do not use portions of pipe where weld opens during cutting or threading operations.

C. Soldered Joints:

1. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook,"

2. Square cut tubing to correct length required to fill sockets.

3. Ream ends and clean surfaces of oils, grease, and oxidation to bright finish with fine sand cloth, cleaning pads, or special wire brush.

4. Apply thin film of solder flux to both surfaces to be joined. Do not clean, flux and assemble joint more than 3 hours before soldering, and do not use acid core, paste type solder, or solder flux combinations.

5. Remove heat-sensitive portions of components prior to soldering. Provide wet rag strip heat sink wrapped around stem and seat of valves and protect all components for soldering heat damage. Replace any components with any evidence of heat damage.

6. Heat joint uniformly and rapidly and fill completely with solder while minimizing external and internal over-soldered dripping.

7. Disassemble joints for inspection of solder penetration as directed. Remake faulty joints at no additional cost.

D. Welded Joints:

1. Comply with the requirements of ASME Code B31.9 - "Building Services Piping", ASME B16.25, and AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

2. Machine-chamfer all pipe ends for butt welded joints.

3. Remove cutting beads and do not allow welding beads to form.

E. Grooved Joints:

1. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness.

2. Assemble joints with coupling and gasket, lubricant, and bolts in accordance with fitting manufacturers written instructions.

3. Install rigid couplings for normal straight pipe runs.

4. Install flexible type couplings for branch take-offs, elbows, as part of the thermal expansion compensation system design, as vibration isolation flexible connections where specified for that, and as otherwise directed.

F. Flanged Joints:

1. Select appropriate gasket material, size, type, and thickness for service application.

2. Install gasket concentrically positioned, and dielectric kits if flanges join dis-similar piping materials.

3. Align flanged surfaces parallel.

4. Use suitable lubricants on bolt threads.

5. Make initial contact of flanges and gaskets flat and parallel with bolts only finger tight, then tighten bolts using alternating sequential pattern, gradually and uniformly to full torque using torque wrench.

G. Plastic Piping Solvent-Welded Joints:

1. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

2. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672.

3. PVC Non-pressure Piping: Join according to ASTM D 2855.

4. Square cut and ream pipe ends to correct length.

5. Clean exterior of pipe and interior of fittings with rags and water and dry thoroughly before solvent cleaning with primer.

6. Check dry fit for interference fit to ensure pipe can be pushed at least 1/3 of way into fitting by hand. Ensure pipe that “bottoms” is snug.

7. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

8. Use only approved cement and primer suitable for types of pipes and fittings used and suitable for intended service, including temperature, pressure pipe size, and fluids served. Use only fresh cement; do not use thickened, lumpy, or "jelly like" cement.

9. Clean pipe and fitting with cement manufacturer’s primer or cleaner. Use contrasting color primer and cement

10. Stir or shake cement before use. Apply thin coat of cement in socket, then evenly coat pipe end to socket depth. Avoid puddling, especially on thin walled pipe.

11. Assemble joint by twisting pipe 1/4 turn while pushing to full socket depth. Provide adequate anchorage and leverage to assemble pipe to full socket depth of fittings; hand pressure is inadequate and not acceptable for larger sizes. Hold pressure for 30 seconds or as required avoiding push out. Allow additional time for cement to set in colder weather to ensure cement film cures without blisters. Wipe off excess cement between socket and pipe with clean, dry rag.

12. Keep cement cool in hot weather and work as quickly as possible to avoid cement setting up before joint is assembled. Keep lid on cements, cleaner, and primers when not in use. Do not mix cleaner or primer with cement.

13. Use 3/4-inch dauber on small diameter pipes, 1-1/2 inch dauber up through 3 inch pipe, and natural bristle brush, swab, or roller 1/2 pipe diameter on pipes 4 inch and up.

3.5 HYDRONIC SPECIALTIES INSTALLATION

A. At each system local or global low point, both in piping and heat transfer elements, and as required for complete system drainage, install drain consisting of a tee fitting and drain valve as described in Section 23 05 23 – General Duty Valves for HVAC Piping.

B. At each system local or global high point, both in piping and heat transfer elements, at the end of each horizontal run before a drop in elevation, and elsewhere as required for complete and serviceable venting of system air, install vent consisting of a tee fitting and air vent as described in Section 23 05 23 – General Duty Valves for HVAC Piping.

C. Install all components of Energy Management and Control System (EMCS) into hydronic systems as required for complete EMCS installation and as required by this section maintaining integrity if hydronic systems. Coordinate all locations and quantities with contractor responsible for the EMCS – refer to Section 23 09 00 – Instrumentation and Control for HVAC.

1. Install control valves in accessible locations close to connected equipment or as otherwise shown, with dis-assemble able connections.
2. Install wells for pressure, temperature, and other sensors as shown on details and as called for by the sequence of operations.

D. Install ports and wells for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages for HVAC Piping."

E. Install piping to pumps. Details of near pump piping are specified in Section 23 21 23 – Hydronic Pumps

F. Install air separator where shown, in general in high temperature low pressure location similar to between boiler outlet and pump suction. Install blowdown piping full size of air separator drain connection, with full-port ball valve; extend full size to point of collection.

3.6 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Clean the interior of all piping prior to installation in systems.

2. Leave joints, including welds, uninsulated and exposed for examination during test.

3. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.

4. Fill and flush hydronic piping systems with clean potable water until system is clean, vent all air from systems then remove and clean or replace all affected strainer screens repeatedly until no further debris is captured. Re-fill and re-vent system.

5. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

6. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.

2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.

3. Isolate expansion tanks and determine that hydronic system is full of water.

4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.

6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.

6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 23 21 13

SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Inline maintenance free circulator pumps
2. Close-coupled, in-line centrifugal pumps.
3. Separately coupled, base-mounted, end-suction centrifugal pumps.
4. Pump Accessories.

1.3 DEFINITIONS

A. Buna-N: Nitrile rubber.

B. EPT: Ethylene propylene terpolymer.

C. SiC: Silicon Carbide.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves. Demonstrate equal or better performance to basis of design equipment in terms of construction, efficiency, dimensions, system connections, etc.

2. Shop Drawings: Show pump layout and connections. Include dimensioned setting drawings for installing foundation and anchor bolts and other anchorages.

3. Motor Data: Motor horsepower, electrical characteristics, and construction details demonstrating compliance with requirements.

4. Machinist’s qualifications.

5. Pump alignment report.

B. Closeout Submittals:

1. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.

B. Machinist Qualifications: Pump alignment machinist shall be a mechanician specializing in machine alignment and set-up with demonstrable training and experience achieving the tolerances specified, employed independently of the pump manufacturer or selling representative**.** Include specifications and calibration for alignment equipment proposed for use on this project's alignment work.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated. Refer to specification Section 01 60 00 "Product Requirements."

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store pumps in dry location.

C. Retain protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

1.7 COORDINATION

A. Coordinate size and location of concrete bases.

1.8 EXTRA MATERIALS

Extra materials may not be allowed for publicly funded projects.

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Revise subparagraph below to suit Project.

1. Filter Cartridges: Minimum one extra filter cartridge for each pump with filtered flush.

PART 2 - PRODUCTS

2.1 GENERAL PUMP REQUIREMENTS

A. Materials: Provide materials suitable for fluid, pressures, temperatures, and conditions for each application.

B. Performance: Minimum of design make throughout operating ranges, including capacity, head, NPSHR, and efficiency.

C. Configuration and Characteristics

1. Provide dynamically balanced pumps for all applications.
2. Provide tapped connections for pressure gauges at inlet and outlet, and vent and drain taps at high and low points.
3. Arrange for independent machinist to align each base mounted pump.

D. Motors:

1. Capable of running continuously without undue noise, heat, sparking, or overloading.

2. Extra quiet operating, EPAC "Plus" premium efficiencies for base-mounted pumps and custom premium efficiency for inline pumps.

3. Sized as non-overloading at 60 Hz with pump operating at any point on the impeller curve.

4. All three phase motors for use with variable speed drives shall be special application, inverter duty design of cast iron TEFC construction. Inverter duty design features shall include an inverter grade Class F insulation system meeting NEMA MG-1, Part 31, Class F thermostats, one per phase, premium efficiency design. Motors shall meet all other requirements of this document, the equipment manufacturer, and the adjustable speed drive manufacturer, and be rated for this service with the drive and voltage intended.

E. Pump Seals: Rated for continuous service for the fluid, temperature, conditions, and pressure of the required service. If conditions are not scheduled, verify in field before submitting Bid.

1. SiC/SiC/EPR Mechanical Seals: Silicon carbide rotating and stationary primary faces, bellows of EPT, EPDM, or other elastomer rated for the service, springs and other wetted seal parts of stainless steel.

a. Provide one spare seal for each mechanically sealed pump, same type as specified, turned over in sealed manufacturer's packaging to Owner. Include receipt with

seal part numbers and contact information for obtaining additional seals in O&M manual.

2. Filters: Provide a filtered flush for seals.

   a. Cartridge Filters For Closed Systems: Cartridge type seal flush filters, factory installed and capable of 98 percent removal of particles 25 microns and larger. Includes in-line sight flow indicator and isolation valves as required to facilitate filter changing without system shutdown.

   b. Quantity: Provide minimum 3 filter cartridges for each system; minimum 1 for temporary use during system startup and commissioning (change to new filter as required during temporary service before final completion), change to new cartridge immediately following acceptance of Substantial Completion, and provide one spare filter cartridge turned over to Owner for each filtered flush system. Include receipt with filter part numbers and contact information for obtaining additional filters in O&M manual.

2.2 INLINE MAINTENANCE FREE WET ROTOR CIRCULATOR PUMPS

Retain "Manufacturers" Paragraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.

A. Manufacturers: Basis of design is as scheduled. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   1. Armstrong Pumps Inc. Series SS or equal
   2. ITT Corporation Bell & Gossett Models NBF or equal
   3. Grundfos Incorporated Series “UP”, “ASTRO” or equal.

B. Designed for continuous operation between 40º and 240ºF.

C. Single stage, in-line suction with all bronze / stainless steel case as required by domestic water service, constructed for 125 psi wp.

D. Enclosed, FRP impeller mounted on a hardened, hollow stainless steel or ceramic shaft, rotating in carbon sleeve product lubricated bearings.

E. Drive motor shall be wet rotor, stainless steel sheathed, directly connected to the shaft, with static o-ring seal. Provide single speed, three speed, or auto-adapt ECM motor as scheduled.

2.3 VERTICAL (OR HORIZONTAL) IN-LINE CENTRIFUGAL PUMPS

Retain "Manufacturers" Paragraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.

A. Manufacturers: Basis of design is as scheduled. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Series 4360, 4380 and 4300 by Armstrong Pumps Inc.
2. Series e-90, e-80, and e-80SC by ITT Corporation; Bell & Gossett.
3. Series VL and VLS by PACO –Grundfos CBS Incorporated.

B. Inline Centrifugal Pumps: Factory assembled and tested, centrifugal, overhung-impeller, close-coupled or split coupled as scheduled, in-line (180 degree opposed connections with common axis) pump designed for installation with pump and motor shafts mounted horizontally or vertically. Internal components capable of servicing without disturbing piping connections, designed for continuous operation between 40 deg. and 250 deg. F.

1. Volute: Single stage, radially split, grade 30 cast iron body, bronze fitted construction, replaceable bronze wear rings, designed for installation in the horizontal or vertical axis position in horizontal or vertical piping. Equal size suction and discharge flanges provided with separate tapped flush line and pressure gage connections suction and discharge.

2. Impeller: ASTM B 584 bronze or stainless steel, precision vacuum cast, closed design with pressure balancing internal flush holes, precision machined and finished on all surfaces removing burrs and casting irregularities resulting in smooth hydraulically efficient surfaces, trimmed as required to meet capacity scheduled, dynamically balanced after trimming to ANSI/HI 9.6.4 grade 6.3, secured to shaft with key and locking stainless steel cap screw.

3. Shaft: Heat-treated alloy steel or stainless steel shaft integral with motor. Alloy steel shafts equipped with replaceable SS shaft sleeve covering all wetted shaft areas including mechanical seal area.

4. Motors:

   a. Integral HP three phase motors: Standard NEMA JM or JP ring mounted motor with extended keyed shaft and heavy-duty re-greaseable grease lubricated ball bearings sized for extended service at the maximum load for which the pump is designed, inverter duty as described above. Motor mounted on precision-machined cast iron motor bracket ensuring positive concentric alignment between motor and volute.

   b. Fractional HP single phase motors: 115/230 volt as scheduled with ECM Permanent Magnet Variable Speed motors with motor mounted controller with user interface. Controller able to adjust motor speed to match flow and head requirements thus substantially reducing power consumption, allow for manual local adjustment, or remote control through EMCS via 0-10 VDC input/output.

5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

6. Mechanical Seal as described above.

7. Supports: Pump volute and motor bracket supported independent of piping with motor supported by motor bracket.

2.4 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers: Basis of design is as scheduled. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

1. Series 4030 by Armstrong Pumps Inc.
2. Series e-1510 by ITT Corporation; Bell & Gossett.
3. Series LF by PACO – Grundfos CBS.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump designed for base mounting, with pump and motor shafts horizontal. Rate pump for 125-psig minimum working pressure and a continuous water temperature of 225 deg F.

C. Pump Construction:

1. Casing: Single stage, radially split allowing true back pull out, grade 30 cast iron body, bronze fitted construction, replaceable bronze or stainless steel wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections. Provide integrally cast and machined mounting feet with through bolt holes to support and secure the casing and attached piping allowing removal and replacement of seals and impeller without disconnecting piping or requiring the realignment of pump and motor shafts.

2. Impeller: ASTM B 584 bronze or stainless steel, precision vacuum cast, closed design with pressure balancing internal flush holes, precision machined and finished on all surfaces removing burrs and casting irregularities resulting in smooth hydraulically efficient surfaces, trimmed as required to meet capacity scheduled, dynamically balanced after trimming to ANSI/HI 9.6.4 grade 2.5, secured to shaft with key and locking stainless steel cap screw.

3. Pump Shaft: Steel, with copper-alloy shaft sleeve, or stainless steel.

4. Pump Bearings: Grease-lubricated ball bearings contained in cast-iron housing with grease fittings.

D. Shaft Coupling: Molded rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. Include EPDM coupling sleeve.

E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels, angles, and plates. Fabricate to mount pump casing, coupling guard, and motor. Include provisions to facilitate solid grouting.

2.5 PUMP ACCESSORIES

A. Pump Suction Diffuser:

1. Angle pattern pump-inlet fitting.
2. Cast-iron body and end cap with integral size reduction from system piping to pump suction size if difference exists.
3. Bronze fine startup screen and bronze or stainless-steel permanent strainers.
4. Bronze or stainless-steel straightening vanes.
5. Drain plug with magnetic insert; and factory-fabricated support.
6. 175-psig pressure rating.

B. Provide pump discharge valve for each pump as specified in Section 23 05 23 – General Duty Valves for HVAC Piping.

C. Provide concrete bases for all base mounted pumps. Refer to Section 23 05 00 - Common Work Results for HVAC and Division 03 for details of required concrete bases.

D. Provide flexible equipment connections for all base mounted pumps. Refer to Section 23 05 43 – Mechanical Vibration and Movement Control for details.

E. Provide a pressure gauge for each pump as specified and as detailed. Refer to Section 23 05 19 – Meters and Gauges for HVAC Systems for details.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which pumps are to be installed and notify Architect in writing of any conditions detrimental to proper and timely installation. Correct unsatisfactory conditions as required, and do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.

1. Insure equipment foundations and anchor-bolt locations are in compliance with installation tolerances and other conditions affecting performance of work and service access.

2. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

3. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.

B. Beginning installation constitutes Contractor’s acceptance of substrates and conditions required to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied.

3.2 PUMP INSTALLATION

A. Install in accordance with manufacturer's specific recommendations and in accordance with all related sections of technical specifications. Obtain manufacturer's instructions and follow them, using the instructions written below as a minimum standard for comparison.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Support piping adjacent to pump connections independently of pumps such that load from piping is not transmitted through pumps.

1. Support piping adjacent to inline pumps securely as required to support pumps from piping. Support with piping supports as specified, with continuous-thread hanger rods and vibration isolators of size required to support weight of in-line pumps.

D. In-line pump mounting:

1. Install in-line pumps weighing under 30 pounds supported from adjacent piping.

2. Provide additional independent supports for in-line pumps weighing 30 pounds and over, similar to flange supports or volute base bracket mountings as recommended by pump manufacturer.

3. Comply with requirements for vibration isolation devices specified in Section 23 05 43 - Mechanical Vibration and Movement Control.

4. Comply with requirements for hangers and supports specified in Section 23 05 29 - Hangers and Supports for HVAC Components.

E. Base mounted pump mounting: Install all base mounted pumps as follows in the sequence written.

1. Install concrete bases of proper dimensions and configuration as specified for pumps and controllers.

2. Install pumps on a concrete base as outlined in Division 23 Section “Common Work Results for HVAC”.

a. Set adjustable internally threaded concrete inserts at appropriate bolt-down locations before pouring equipment bases.
b. Be responsible for accurate size of base and exact location of mounting bolts.
c. Disconnect coupling before setting. Do not reconnect couplings until alignment procedure is complete.

3. Fasten all pump bases to concrete bases with foundation bolts.

a. Insure that the pump suction and discharge flanges are orthogonal to the structural base of the pump without shimming. Securely tighten all pump volute mounting bolts to the pump base, and use the discharge flange surface for leveling and the

pump base rails for lateral alignment of the pump to the system. Align the motor to the pump after the pump base is properly grouted.

b. Properly level each pump base. Use metal wedges and/or shims set on both sides of every bolt. Make a minimum gap of three times the grout aggregate size or 1/2-inch, whichever is greater.

c. Securely tighten all pump base bolts.

d. Remove projecting parts of wedges and shims.

4. Properly grout the complete base.

a. Fill all pump bases with grout conforming to CRD-C-621-80 "Corps of Engineers Specification for Non-Shrink Grout", and as detailed in Division 03.

b. Fill base through grouting holes provided in baseplate.

c. After grout has hardened for a minimum of seven (7) days, re-tighten all pump foundation bolts and only then align pumps.

5. Align pumps.

a. Engage an INDEPENDENT MACHINIST to align and verify alignment of each pump and to certify and deliver report on measured alignment tolerances achieved.

b. Submit machinist's name, business address, and qualifications.

c. Do not pipe or start up any pump until after alignment is complete and correct. Do not align pumps until pumps are installed on concrete bases and grouted as specified above.

d. Align all pumps by moving the motor with respect to the fixed impeller housing.

e. If the impeller housing flanges are substantially out of level and/or alignment with respect to the system, bring them into alignment using a minimum of shims and an appropriate thinset grout before aligning the motor.

f. Motor shaft to impeller shaft alignment tolerances:

1) Align to the stricter of:

a) Manufacturer’s printed alignment tolerances.
b) 0.004-inch total indicator reading (TIR) radial and 0.004-inch TIR angular at 3-inch radius.

g. After pumps are aligned, install dowels to prevent shifting and properly re-install coupling and guard.

h. Within two business days of alignment, submit a written report certified by machinist guaranteeing that alignment is complete and stating the alignment tolerances required and obtained.

i. Contractor is responsible for trouble resulting from poor pump alignment.

6. Connect the pipe system to the pumps:

a. Install inlet suction diffusers for all end suction pumps with support legs adjusted to prevent any strain on the pump inlet.

b. Install pipeline flexible connectors at each suction (diffuser) and discharge port of each pump. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

c. Pipe as required by the detail pump connection drawings, including all valves, fittings, gauges, and controls.

7. Three operating months later, have the machinist recheck all alignments, recording data, correcting any changes, and reporting in writing to the Contractor and Architect all data and offering an interpretation of the cause and significance of the changes.

8. Submit letter attesting to completion of alignment.

F. Adjust GPM of each pump to capacity called for during balancing.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to pumps. Install isolation valves on both suction and discharge that are same size as piping shown approaching the pumps, prior to any size change required at pump connections.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install triple-duty valve on discharge side of pumps.

F. Install suction diffuser on suction side of all base mounted pumps.

1. Install suction diffuser on suction side of in-line pumps where a minimum of five pipe diameters straight line size pipe cannot be maintained at and in line with pump inlet.

G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

H. Install pressure gauges on pumps as specified.

I. Install electrical connections for power, controls, and devices in accordance with Section 23 29 00 – Variable Speed Motor Controllers, Section 23 05 13 – Common Electrical Requirements for HVAC, and Division 26.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

2. Check piping connections for tightness.

3. Clean strainers on suction piping.

4. Perform the following startup checks for each pump before starting:

   a. Verify bearing lubrication.
   b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
   c. Verify that pump is rotating in the correct direction.

5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.

6. Start motor.

7. Open discharge valve slowly.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps. Refer to specification Section 01 79 00 - "Demonstration and Training."

END OF SECTION 23 21 23

SECTION 23 29 00 – VARIABLE FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes separately enclosed, pre-assembled, combination VFCs (variously referred to as VFC, ASD, VSD, or VFD), rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

1. "Micro-drive": VFC for use with motors of 1HP or less (unless scheduled otherwise), capable of and designed for driving three phase motors with single phase or three phase input line power, as required.
2. "General Purpose" VFC for use with motors > 1HP (unless scheduled otherwise)

1.3 DEFINITIONS

A. ASD: Adjustable Speed Drive, same as VFC.
B. BAS: Building automation system
C. CPT: Control power transformer.
D. EMI: Electromagnetic interference.
E. EMC: Electromagnetic Compliance.
F. IGBT: Insulated-gate bipolar transistor.
G. LAN: Local area network.
H. LED: Light-emitting diode.
I. MCP: Motor-circuit protector.
J. NC: Normally closed.
K. NO: Normally open.
L. OCPD: Overcurrent protective device.
M. Output: Variable frequency output power and wiring between the VFC and the load (motor).
N. PCC: Point of common coupling.
O. PID: Control action, proportional plus integral plus derivative.
P. Power: source electrical power input wiring to the VFC.
Q. PWM: Pulse-width modulated.
R. RFI: Radio-frequency interference.
S. Signal: Remote generated electrical signal causing controlled variation in VFC output.
T. TDD: Total demand (harmonic current) distortion.
U. THD(V): Total harmonic voltage demand.
V. VFC: Variable-frequency motor controller.
W. VFD: Variable Frequency Drive, same as VFC.
X. VSD: Variable Speed Drive, same as VFC.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: VFCs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

B. Design and Performance Requirements

1. Designed to convert 60 Hz input power to adjustable frequency output power with constant and/or variable volts/Hz ratio output power. Output frequency and drive voltage adjustable determined by design parameters of driven motor.

2. Capable of operating any standard squirrel cage induction motor with load rating within capacity of adjustable speed drive. Allows substitution of standard motor in field without requiring modification of adjustable speed drive.

3. Designed and manufactured in accordance with applicable current NEMA and IEEE recommendations and designed for installation per NEC. Includes equipment with UL and CSA approval as applicable.

4. Suitable for installation in altitudes up to 3300 ft with ambient temperature range from 32 deg F to 104 deg F

5. Designed with dedicated variable torque design for specified use with centrifugal loads.

6. “Micro-Drive” includes all of above features plus:

a. Capable of and designed for converting single-phase input to three phase output.

7. “General Purpose” Drive includes all of above features plus:

a. Suitable to serve as starter and disconnect.
b. Designed with surface-mount construction regulator circuits.
c. Provided with UL-listed electrical components in basic ASD, including but not limited to contactors, overload relays, pushbuttons, pilot devices, and other control devices.

1.5 SUBMITTALS

A. Procedural Requirements: Comply with requirements of SECTION 01 33 00 - Submittals and as modified below.

B. Product Data: For each type and rating of VFC indicated. Include features, performance, electrical ratings, operating characteristics, shipping and operating weights, and furnished specialties and accessories. Include output cabling.

C. Shop Drawings: For each VFC indicated. Include dimensioned plans, elevations, and sections; and conduit entry locations and sizes, mounting arrangements, and details, including required clearances and service space around equipment.

1. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Enclosure types and details.
d. Nameplate legends.
e. Short-circuit current (withstand) rating of enclosed unit.
f. Features, characteristics, ratings, and factory settings of each VFC and installed devices.
g. Specified modifications.

2. Schematic and Connection Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Harmonic Analysis Study and Report: Comply with IEEE 399 and NETA Acceptance Testing Specification and IEEE519 Guidelines for both Current and Voltage Distortion in a distribution system; identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system. Analyze operating scenarios, including recommendations for VFC input filtering to limit TDD and THD(V) at each VFC to specified levels. Include measurements taken on the line side of the main distribution transformer coordinated with local electrical utility, or if not possible from the load or low voltage side of that same transformer.

B. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around VFCs. Show VFC layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

C. Qualification Data: For qualified testing agency.

D. Seismic Qualification Certificates: For VFCs, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based, and their installation requirements.

E. Product Certificates: For each VFC, from manufacturer.

F. Source quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Field quality-control reports.

B. Operation and Maintenance Data: For VFCs to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and MCP trip settings.
2. Manufacturer's written instructions for setting field-adjustable overload relays.
3. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
4. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

C. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate, full-load currents.

D. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. IEEE Compliance: Fabricate and test VFC according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Furnish all equipment in cartons and within shrink-wrapped plastic to Project in ample time for installation. Properly tag and identify equipment furnished.

B. Storage and Protection: Store all equipment between delivery and installation in secure location that is dry, permanently enclosed, heated, and air conditioned as required to eliminate any condensation, moisture, heat or cold related damage.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than 14 deg F and not exceeding 104 deg F.
2. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F
3. Humidity: Less than 95 percent (noncondensing).
4. Altitude: Not exceeding 3300 feet.

B. Interruption of Existing Electrical Systems: Do not interrupt electrical systems in facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than seven days in advance of proposed interruption of electrical systems.
2. Indicate method of providing temporary electrical service.
3. Do not proceed with interruption of electrical systems without Construction Manager's and Owner's written permission.
4. Comply with NFPA 70E.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFCs, including clearances between VFCs, and adjacent surfaces and other items.

1.11 COORDINATION

A. Coordinate features of motors, load characteristics, installed units, and accessory devices to be compatible with the following:

1. Torque, speed, horsepower, overall power, and other electrical requirements of the load.
2. Ratings and characteristics of supply circuit and required control sequence.
3. Distance of VFC from load and conditions of signal cable installation.
4. Ambient and environmental conditions of installation location.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

1.13 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.
4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB.
2. AC Technology International Ltd (AC Tech); part of the Lenze Group.
3. Square D; a brand of Schneider Electric.
4. Yaskawa America, Inc; Drives Division.

B. General Requirements for VFCs: Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508C.

C. Application: Variable torque.

D. VFC Description: Variable-frequency power converter (rectifier, dc bus, and IGBT, PWM inverter) factory packaged in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of NEMA MG 1, Design A and Design B motors as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."

2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."

3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

E. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

F. Output Rating: Three-phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

G. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 15 percent of VFC input voltage rating.
2. Input AC Voltage Unbalance: Not exceeding 3 percent.
3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
4. Minimum Efficiency: 97 percent at 60 Hz, full load.
5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
6. Minimum Short-Circuit Current (Withstand) Rating: 42 kA.
7. Ambient Temperature Rating: Not less than 14 deg F and not exceeding 104 deg F.
8. Ambient Storage Temperature Rating: Not less than minus 4 deg F and not exceeding 140 deg F
9. Humidity Rating: Less than 95 percent (noncondensing).
10. Altitude Rating: Not exceeding 3300 feet.
11. Vibration Withstand: Comply with IEC 60068-2-6.
12. Overload Capability: 1.1 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
13. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
14. Speed Regulation: Plus or minus 5 percent.
15. Output Carrier Frequency: Selectable; 0.5 to 12 minimum kHz.
16. Minimum 0.14µs Dt rise time or other improved technology which limits transient voltage spikes; such as soft switching.
17. Stop Modes: Programmable; includes fast, free-wheel, high slip and dc injection braking.

H. Inverter Logic: Microprocessor based, 32 bit, isolated from all power circuits.

I. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.

J. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 0.1 to 999.9 seconds.
4. Deceleration: 0.1 to 999.9 seconds.
5. Current Limit: 30 to minimum of 150 percent of maximum rating.

K. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors to provide three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.

2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.

3. Under- and overvoltage trips.

4. Inverter overcurrent trips.

5. VFC and Motor Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC overtemperature and motor overload alarm and trip; settings selectable via the keypad; NRTL approved.

6. Critical frequency rejection, with three selectable, adjustable deadbands.

7. Instantaneous line-to-line and line-to-ground overcurrent trips.

8. Loss-of-phase protection.

9. Reverse-phase protection.

10. Short-circuit protection.

11. Motor overtemperature fault.

L. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.

M. Bidirectional Autospeed Search: Capable of starting VFC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.

N. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

O. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

P. Integral Input Disconnecting Means and OCPD: NEMA AB 1, instantaneous-trip circuit breaker with pad-lockable, door-mounted handle mechanism.

1. Disconnect Rating: Not less than 115 percent of VFC input current rating.
2. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.
3. Auxiliary Contacts: NO/NC, arranged to activate before switch blades open.
4. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
5. NC or NO alarm contact that operates only when circuit breaker has tripped.

2.2 CONTROLS AND INDICATION

A. All VSDs:

1. Adjustments accessible from a keypad integral to VSD.

2. Auto/Manual, Start/Stop, and speed selection accessible on the front of the controller.

3. Power-on, run and trip monitor indications displayed by backlit LCD on the front of the controller.

4. Linear timed acceleration and deceleration, individually adjustable with 0.1 - 600 seconds range.

5. Minimum 40:1 controlled speed range.

6. Minimum 0.1-120 Hz output frequency range.

7. Adjustable Volts/Hz ratio with both factory preset and custom tunable options. Voltage boost adjustable in addition to V/Hz ratio.

8. Controller capable of restarting with the motor coasting in either forward or reverse direction without tripping.

9. Minimum Hertz (0-50 percent), maximum Hertz (50-100 percent).

10. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display VFC status, alarms, and energy usage. Allows VFC to be used with an external system within a multidrop LAN configuration; settings retained within VFC's nonvolatile memory.

    a. Network Communications Ports: Ethernet and RS-422/485.
    b. Embedded BAS Protocols for Network Communications: ASHRAE 135 BACnet and/or Echelon LonWorks; protocols accessible via the communications ports.

B. All “General Purpose” drives, optional for “Micro” drives:

1. Status Lights: Door-mounted LED indicators displaying the following conditions:

    a. Power on.
    b. Run.
    c. Overvoltage.
    d. Line fault.
    e. Overcurrent.
    f. External fault.

2. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.

    a. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.

    b. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service.

1) Control Authority: Supports at least four conditions: Off, local manual control at VFC, local automatic control at VFC, and automatic control through a remote source.

3. Historical Logging Information and Displays:

a. Real-time clock with current time and date.
b. Running log of total power versus time.
c. Total run time.
d. Fault log, maintaining last four faults with time and date stamp for each.

4. Indicating Devices: Digital display mounted flush in VFC door and connected to display VFC parameters including, but not limited to:

a. Output frequency (Hz).
b. Motor speed (rpm).
c. Motor status (running, stop, fault).
d. Motor current (amperes).
e. Motor torque (percent).
f. Fault or alarming status (code).
g. PID feedback signal (percent).
h. DC-link voltage (V dc).
i. Set point frequency (Hz).
j. Motor output voltage (V ac).

5. Control Signal Interfaces:

a. Electric Input Signal Interface:

1) A minimum of 2 programmable analog inputs: 0- to 10-V dc and 4- to 20-mA dc.
2) A minimum of six multifunction programmable digital inputs.

b. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BAS or other control systems:

1) 0- to 10-V dc.
2) 4- to 20-mA dc.
3) Potentiometer using up/down digital inputs.
4) Fixed frequencies using digital inputs.

c. Output Signal Interface: A minimum of 2 programmable analog output signal(s) (0- to 10-V dc or 4- to 20-mA dc), which can be configured for any of the following:

1) Output frequency (Hz).
2) Output current (load).
3) DC-link voltage (V dc).
4) Motor torque (percent).
5) Motor speed (rpm).
6) Set point frequency (Hz).

d. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

1) Motor running.
2) Set point speed reached.
3) Fault and warning indication (overtemperature or overcurrent).
4) PID high- or low-speed limits reached.

6. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display VFC status and alarms and energy usage. Allows VFC to be used with an external system within a multidrop LAN configuration; settings retained within VFC's nonvolatile memory.

a. Network Communications Ports: Ethernet and RS-422/485.
b. Embedded BAS Protocols for Network Communications: ASHRAE 135 BACnet and/or Echelon LonWorks; protocols accessible via the communications ports.

2.3 PROTECTION:

A. All VSDs:

1. Lockable enclosure containing drive, line reactor, and fused exterior disconnect protecting all components. Enclosure large enough to facilitate ease of service, configured to fit in available mounting location and allow for rapid change-out of micro drive.

2. Includes capability of riding though power dips up to 2 seconds without a controller trip depending on load and operating condition. During ride through, drive uses energy generated by the rotating load as a power source for all electronic circuits.

3. Instantaneous electronic trip when the current demands of the invertor exceed its intermittent rating, 300 percent maximum.

4. Electronic overload circuit to protect AC motors operated by the VSD output from extended overload operation on an inverse time basis UL and NEC recognized as motor protection.

5. Enclosure, fuses, circuit breakers, and contactors as required allowing use as motor protection per strictest of regulatory requirements having jurisdiction.

6. Minimum 75 percent input line under voltage trip; average 120 percent over voltage.

7. Line-to-line and line-to-ground short circuit protection.

2.4 BYPASS SYSTEMS

A. “Micro” Drive: No bypass required. Provide “Spare” drives as follows:

1. For each building in project where “Micro” drives are utilized, provide one spare drive of each unique configuration (voltage/phase/HP) “Micro” Drive installed as part of project,

minimum two if only one configuration is used. Deliver spare drives to Owner and provide Architect with letter signed by owner confirming receipt of spare "Micro" drives.

B. Bypass Operation: Safely transfers motor between power converter output and bypass circuit, manually, automatically, or both. Selector switches set modes and indicator lights indicate mode selected. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.

C. Bypass Mode: Field-selectable automatic or manual, allows local and remote transfer between power converter and bypass contactor and retransfer, either via manual operator interface or automatic control system feedback.

D. Bypass Controller: Three contactor bypass or two-contactor-style bypass that allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

1. Bypass Contactor: Load-break, IEC-rated contactor.

2. Output Isolating Contactor: Non-load-break, IEC-rated contactor.

3. Input Isolating Contactor: Non-load-break, IEC-rated contactor.

4. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.

E. Bypass Contactor Configuration:

1. NORMAL/BYPASS selector switch.

2. HAND/OFF/AUTO selector switch.

3. NORMAL/TEST Selector Switch: Allows testing and adjusting of VFC while the motor is running in the bypass mode.

4. Overload Relays: NEMA ICS 2.

a. Solid-State Overload Relays:

1) Switch or dial selectable for motor-running overload protection.
2) Sensors in each phase.
3) Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
4) Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
5) Analog communication module.

b. NO isolated overload alarm contact.

c. External overload reset push button.

2.5 OPTIONAL FEATURES

A. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.

B. Remote digital operator kit.

C. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer and a notebook computer.

2.6 ENCLOSURES

A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.

1. Indoor Locations: Type 1.

2.7 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VSD enclosure cover unless otherwise indicated. Pilot Lights: LED types; colors as required; push to test.

B. Reversible NC/NO bypass contactor auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.

E. Supplemental Digital Meters:

1. Elapsed-time meter.
2. Kilowatt meter.
3. Kilowatt-hour meter.

F. Cooling Fan and Exhaust System: As required for NEMA 250, Type 12; UL 508 component recognized: Supply fan, with composite or stainless steel intake and exhaust grills and filters; 120 -V ac; obtained from integral CPT.

G. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

H. Output Cable: Provide sufficient special purpose VFC output cable for all power wiring between all VFCs and their respective loads, sized per the stricter of NEC, drive and motor manufacturer's recommendations, or as shown on drawings.

1. Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2. VFC Cable: Type TC-ER low-capacitance shielded VFC cabling with oversized crosslinked polyethylene insulation over tin-coated high strand count conductors, spiral-wrapped foil plus full coverage braided shields in direct contact with symmetrical ground conductors (one per power conductor), and sunlight- and oil-resistant outer PVC jacket.

3. Capacitance value core to core less than 75pF/m, core to shield less than 150pF/m.

4. Basis of design: Amercable TC-ER VFD cable, or equal by Beldon or Carol.

2.8 SOURCE QUALITY CONTROL

A. Testing: Test and inspect VFCs according to requirements in NEMA ICS 61800-2.

1. Test each VFC while connected to a motor that is comparable to that for which the VFC is rated.
2. Verification of Performance: Rate VFCs according to operation of functions and features specified.

B. VFCs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance.
B. Examine VFC before installation. Reject VFCs that are wet, moisture damaged, or mold damaged.
C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.
D. Proceed with installation only after unsatisfactory conditions have been corrected.
E. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

A. Coordinate layout and installation of VFCs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required access, workspace clearances, and required clearances for equipment access doors and panels. Install VFCs in an upright position.

B. Install VFCs including all transformers, line reactors, bypass enclosures and other accessories, on walls or equipment racks level, upright, with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall or

floor. For controllers not on walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."

C. Seismic Bracing: Comply with requirements specified in Section 23 05 48 - Mechanical Seismic and Wind Load Controls."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Comply with NECA 1.

3.3 CONTROL AND POWER WIRING INSTALLATION

A. Install wiring between VFCs and remote devices and facility's central-control system. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Bundle, train, and support line, load, and control wiring in separate enclosures.

C. Install output cabling in strict accordance with manufacturers' recommendations. Provide for strain relief and cabling protection from damage. Verify cable length prior to installation and provide output line reactor if length exceeds that specified.

D. Connect selector switches and other automatic control devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic control devices that have no safety functions when switches are in manual-control position.

2. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.4 IDENTIFICATION

A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Division 23 Section "Identification for HVAC Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each VFC with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFC units.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each VFC element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.

2. Test insulation resistance for each VFC element, component, connecting motor supply, feeder, and control circuits.

3. Test continuity of each circuit.

4. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager before starting the motor(s).

5. Test each motor for proper phase rotation.

6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but before Final Completion and Acceptance, perform an infrared scan of each VFC. Remove front panels so joints and connections are accessible to portable scanner.

b. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

c. Re-tighten all connections as required.

d. Generate report for inclusion in close-out documentation including color thermography printouts showing acceptable results.

e. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each VFC 11 months after date of Substantial Completion.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. VFCs will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.6 STARTUP SERVICE

A. Provide services of a manufacturer's factory –authorized service representative to inspect complete installation, start and adjust each drive, and train the Owner in drive operation, maintenance, and adjustment.

B. Coordinate services of adjustable speed drive factory –authorized service representative, TAB Agency, and Controls Technicians to insure proper coordinated operation and system control.

C. Complete additional installation and startup checks according to manufacturer's written instructions.

D. Submit letter from manufacturer's factory –authorized service representative attesting to the satisfactory completion of installation and startup, with attached start-up / calibration forms for each drive with all appropriate adjustment settings itemized.

3.7 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

C. Fully adjust each adjustable speed drive including maximum and minimum speeds, rates of speed change, calibration, testing, and as otherwise required to meet the operational intent and all control sequences.

D. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Architect and Construction Manager before increasing settings.

E. Set the taps on reduced-voltage autotransformer controllers.

F. Set field-adjustable circuit-breaker trip ranges as specified in Division 26.

3.8 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.

B. Replace VFCs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFCs.

1. Submit letter from factory-authorized service representative attesting to the satisfactory completion of Owner’s training, signed by Owner’s representatives.

END OF SECTION 23 29 00

SECTION 23 51 00 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Listed gas vents.
   2. Connectors, fittings, and other accessories.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

   1. Type B and BW vents.
   2. Connectors.

B. Calculations: For each venting system, provide stack calculations generated by vent manufacturer's computerized calculation software, demonstrating appropriate venting conditions. Accompany calculations with letter by authorized representative of boiler manufacturer on their letterhead stating venting system as designed is approved for the boiler system proposed.

C. Shop Drawings: For vents include plans, elevations, sections, details, and attachments to other work.

   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, methods of field assembly, components, hangers and seismic restraints, and location and size of each field connection.

1.5 CLOSEOUT SUBMITTALS

A. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain listed system components through one source from a single manufacturer.

B. Certified Sizing Calculations:

1. Venting and Boiler Manufacturer shall certify venting system sizing calculations.

2. Include boiler operating data as approved and recommended by Boiler Manufacturer, actual field dimensions measured by Contractor, and actual fitting and duct losses as certified by Vent Manufacturer.

3. Assume an average winter ambient temperature of 20 degrees F, an average winter indoor temperature of 70 degrees F, and boilers operating at the typical design return and supply water conditions indicated on the drawings.

1.7 COORDINATION

A. Coordinate installation of existing vent and intake penetrations thru roof for boiler vent requirements.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of venting system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, structural failures caused by expansion and contraction.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LISTED SPECIAL GAS VENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Heat-Fab, Inc.
2. Metal-Fab, Inc.
3. Selkirk Inc.; Selkirk Saf-T Vent CI Plus.
4. Z-Flex; Flexmaster Canada Limited.

B. Description: Double-wall metal vents tested according to UL 1738 rated for continuous firing at up to 550 deg F with gas.

C. Listed for ANSI category I, II, III, or IV appliances, with positive or negative flue pressure complying with NFPA 211.

D. Construction: Inner shell and outer jacket separated by at least a 1 inch airspace.

E. Inner Shell: ASTM A 959, Type 29-4C stainless steel.

F. Outer Jacket: Stainless steel.

G. Accessories: Tees, elbows, increasers, connectors, terminations, storm collars, support assemblies, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

1. Termination: Stack cap designed to exclude minimum 90 percent of rainfall, with drain section incorporated into base of riser.

2.2 PLASTIC VENT AND CONDENSATE PIPE AND FITTINGS

A. CPVC Plastic Pipe: ASTM F 441/F 441M, Schedules 40 and 80, plain ends as indicated in Part 3 "Piping Applications" Article.

B. CPVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM F 438 for Schedule 40 pipe; ASTM F 439 for Schedule 80 pipe, long radius pattern.

C. Condensate Neutralizing Tank: Provide each condensing boiler system with at least one condensate neutralizing tank. Neutralizing tank(s) size as follows: larger of two gallons or 1.5 gallon per million BTU/hr boiler input capacity (volume measured below level of boiler condensate trap outlet). Condensate neutralizing tank constructed of 4” or 6” diameter schedule 40 PVC pipe assembly with threaded condensate inlet and outlet connections, a threaded side cleanout cover, and supports. Fill with appropriately sized limestone gravel. Provide limestone gravel as required to fill all neutralizing tanks, plus 5 gallons extra per boiler room; leave extra in lidded 5 gallon pail for Owner’s future use. Pipe neutralizing tank with unions for service removal, extend outlet to floor drain.

D. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.

a. Use CPVC solvent cement that has a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), in contrasting color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify locations and sizes of existing vent roof penetrations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 APPLICATION

A. Listed Special Gas Vent: Condensing gas appliances.

B. Plastic Vent and Condensate Piping: for use with high efficiency category IV appliances only where manufacturer's installation instructions include PVC or CPVC vent and condensate drain piping.

3.3 INSTALLATION OF LISTED VENTS AND CHIMNEYS

A. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.
B. Slope vents down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.
C. Lap joints in direction of flow.
D. Join sections with acid-resistant joint cement to provide continuous joint and smooth interior finish.

3.4 INSTALLATION OF UNLISTED, FIELD-FABRICATED BREECHINGS AND CHIMNEYS

A. Suspend breechings and chimneys independent of their appliance connections.

B. Align breechings at connections, with smooth internal surface and a maximum 1/8-inch misalignment tolerance.

C. Slope breechings down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.

D. Lap joints in direction of flow.

E. Plastic Piping Solvent-Welded Joints:

1. CPVC Vent and Condensate Drain Piping: Join according to ASTM D 2846/D 2846M Appendix.

2. Square cut and ream pipe ends to correct length.

3. Clean exterior of pipe and interior of fittings with rags and water and dry thoroughly before solvent cleaning with primer.

4. Check dry fit for interference fit to ensure pipe can be pushed at least 1/3 of way into fitting by hand. Ensure pipe that "bottoms" is snug.

5. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

6. Use only approved cement and primer suitable for types of pipes and fittings used and suitable for intended service, including temperature, pressure pipe size, and fluids served. Use only fresh cement; do not use thickened, lumpy, or "jelly like" cement.

7. Clean pipe and fitting with cement manufacturer's primer or cleaner. Use contrasting color primer and cement

8. Stir or shake cement before use. Apply thin coat of cement in socket, then evenly coat pipe end to socket depth. Avoid puddling, especially on thin walled pipe.

9. Assemble joint by twisting pipe 1/4 turn while pushing to full socket depth. Provide adequate anchorage and leverage to assemble pipe to full socket depth of fittings; hand pressure is inadequate and not acceptable for larger sizes. Hold pressure for 30 seconds or as required avoiding push out. Allow additional time for cement to set in colder weather to ensure cement film cures without blisters. Wipe off excess cement between socket and pipe with clean, dry rag.

10. Keep cement cool in hot weather and work as quickly as possible to avoid cement setting up before joint is assembled. Keep lid on cements, cleaner, and primers when not in use. Do not mix cleaner or primer with cement.

11. Use 3/4-inch dauber on small diameter pipes, 1-1/2 inch dauber up through 3 inch pipe, and natural bristle brush, swab, or roller 1/2 pipe diameter on pipes 4 inch and up.

12. Install vent piping sloped continuously up in the direction of flow, such that any condensate formed counter-flows back towards appliance.

13. Install condensate drain piping sloped continuously down in direction of flow towards drain. Pipe from appliance, breeching, and stack drains through approved condensate neutralizing station to approved indirect waste receptor.

3.5 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.
B. Clean vents internally, during and after installation, to remove dust and debris.
C. Provide temporary closures at ends of vents that are not completed or connected to equipment.

END OF SECTION 23 51 00

SECTION 23 52 16 - CONDENSING BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged, factory-fabricated and assembled, gas fired, fire-tube condensing boilers, trim, and accessories for heating water.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For boilers, boiler trim, and accessories. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Special warranty specified in this Section.
B. Other Informational Submittals:

1.6 CLOSEOUT SUBMITTALS

A. Field quality-control test reports.
B. Operation and Maintenance Data: For boilers to include in emergency, operation, and maintenance manuals.
C. Warranty: Executed special warranty specified in this Section.

1.7 QUALITY ASSURANCE

A. Provide all boilers/burners in accordance with applicable requirements of New York State Labor Department Industrial Code Rule No. 4 (cited as 12 NYCRR4) and Code Rule No. 14 (cited as 12 NYCRR14).

B. Provide all boilers/burners in accordance with applicable requirements of New York State Education Department Manual of Planning Standards.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

E. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

F. UL Compliance: Test boilers for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

G. I=B=R Performance Compliance: Condensing boilers must be rated in accordance with applicable federal testing methods and verified by AHRI as capable of achieving the energy efficiency and performance ratings as tested within prescribed tolerances.

H. Do not allow boilers to be operated unsupervised until all operating and safety controls have been verified as properly installed and tested as properly functional.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 23 05 00 and Division 03.

1.9 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents. Provide parts and labor warranty covering the complete boiler installation: at no additional charge, correct all defects in workmanship and materials reported within (1) year from the date established on certificate of substantial completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Fire-Tube Condensing Boilers:

    a. Leakage and Materials: 10 years from date of Substantial Completion.
    b. Heat Exchanger Damaged by Thermal Stress and Corrosion: Non-prorated for 10 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

A. Provide factory authorized service as outlined in Part 3 of this specification for a minimum of one year from date established on certificate of substantial completion.

B. Provide factory authorized maintenance service as required to maintain the boiler and burner system in good operating order at no additional charge for one (1) year from date established on certificate of substantial completion. In addition to initial start-up, a full tune up is required at the start of the first heating season and additionally within one month of the end of this one year service period. Combustion and thermal performance at eleven month tune up must be equal to or better than those set at initial start-up, with combustion reports printed directly off an electronic combustion analyzer. Include all parts and labor, including maintenance parts kits normally required for 24 month tune-up (gasket kit, ignition rods or electrodes as required, etc.).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AERCO International.
2. Advanced Thermal Hydronics (a Mestek Company) KN series.
3. Cleaver Brooks – Clear Fire.
4. Heat Transfer Products, Inc.
5. Lochinvar Boiler
6. Thermal solutions

B. Due to differences in size and access clearances, piping connections, working pressures, burner configuration, venting, sequencing, etc.., proposed use of boilers other than the basis of design Boilers and Burners scheduled will require detailed review of required changes and incorporation of this into boiler room shop drawings and design. Refer to Instructions to Bidders, General Conditions, Division 1, and section 23 05 00 – Common Work Results for HVAC, for additional provisions and requirements relating to specified equivalent, proposed equivalent, or substitution products.

2.2 FIRE-TUBE CONDENSING BOILERS

A. Description: Natural gas fired, fully condensing, fire tube design boiler. Power burner with full modulation and discharge into a positive pressure vent. Boiler efficiency shall increase with decreasing load (output), while maintaining setpoint. Factory-fabricated, -assembled, and -tested, fire-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.

B. Heat Exchanger: Constructed of 439 stainless steel fire tubes and tubesheets, with a one-pass combustion gas flow design. The fire tubes 5/8" OD, with no less than 0.065" wall thickness. The upper and lower stainless steel tubesheet to be no less than 0.25" thick. The pressure vessel/heat exchanger to be welded construction. ASME stamped for a working pressure not less than 150 psig. Access to the tubesheets and heat exchanger shall be available by burner and exhaust manifold removal. Minimum access opening to be no less than 8-inch diameter.

C. Pressure Vessel: Maximum water volume of 55 gallons. The boiler water pressure drop to not exceed 3 psig at 261 gpm. 4-inch flanged 150-pound, boiler water connections ANSI rated. The pressure vessel to be constructed of SA53 carbon steel, with a 0.25-inch thick wall and 0.50-inch thick upper head. Inspection openings in the pressure vessel are be in accordance with ASME Section IV pressure vessel code. Designed so that the thermal efficiency increases as the boiler firing rate decreases.

D. Modulating Air/Fuel Valve and Burner: The boiler burner to be capable of a 15-to-1 turndown ratio of the firing rate without loss of combustion efficiency or staging of gas valves. The burner is to produce less than 20 ppm of NOx corrected to 3 percent excess oxygen. The unit to be certified by the South Coast Air Quality Management District (SCAQMD) as compliant with Rule 1146.1 for boilers and water heaters greater than 2 MBTU's and less than 5 MBTUs. The burner shall be metal-fiber mesh covering a stainless steel body with spark ignition and flame rectification. All burner material exposed to the combustion zone shall be of stainless steel construction. There shall be no moving parts within the burner itself. A modulating air/fuel valve shall meter the air and fuel input. The modulating motor must be linked to both the gas valve body and air valve body with a single linkage. The linkage shall not require any field adjustment. A variable frequency drive (VFD), controlled cast aluminum pre-mix blower shall be used to ensure the optimum mixing of air and fuel between the air/fuel valve and the burner.

E. Minimum Boiler Efficiencies: Minimum boiler efficiencies are to be as follows at a 20 degree delta-T:

EWT	100% Fire	80% Fire	60%	40% Fire	20% Fire	7% Fire
160 °F	86.5%	87%	87%	87%	87%	87%
140 °F	87.5%	87.5%	87.5%	87.5%	87.5%	88%
120 °F	89%	89%	89%	90%	90%	90%
100 °F	93.2%	94.5%	94.6%	95.02%	95.4%	95.4%
80 °F	95.6%	96.3%	96.8%	97.8%	98.%	98.2%

F. Exhaust Manifold: The exhaust manifold to be of corrosion resistant cast aluminum with an 8-inch diameter flue connection. The exhaust manifold shall have a collecting reservoir and a gravity drain for the elimination of condensation.

G. Blower: The boiler to include a variable-speed, DC centrifugal fan to operate during the burner firing sequence and pre-purge the combustion chamber.

1. Motors:

a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

H. Ignition: Ignition shall be via spark or proven pilot ignition with 100 percent main-valve shutoff and electronic flame supervision.

I. Combustion Air: The boiler shall be designed such that the combustion air is drawn from the inside of the boiler enclosure, decoupling it from the combustion air supply and preheating the air to increase efficiency.

J. Combustion Air Filter: The boiler shall be equipped with an automotive high flow air filter to ensure efficient combustion and unhindered burner components operation.

K. O_2 sensor located in the Combustion Chamber: The boiler shall be equipped with an Oxygen sensor. The sensor shall be located in the boiler combustion chamber. Boilers without Oxygen sensor or boilers with an Oxygen sensor in the exhaust shall not be acceptable due to measurement estimation and performance accuracy.

L. Gas Train: Combination gas valve with manual shutoff and pressure regulator.

M. Ignition: Spark ignition with 100 percent main-valve shutoff with electronic flame supervision.

N. Casing:

1. Jacket: Sheet metal, with snap-in or interlocking closures.
2. Control Compartment Enclosures: NEMA 250, Type 1A.
3. Finish: Powder-coated protective finish.
4. Insulation: Minimum 2-inch- thick, mineral-fiber insulation surrounding the heat exchanger.
5. Combustion-Air Connections: Inlet and vent duct collars.
6. Mounting base to secure boiler.

2.3 TRIM

A. Aquastat Controllers: Operating, firing rate, and high limit.

B. Pressure and Temperature Gage: Minimum 3-1/2-inch- diameter, combination water-pressure and -temperature gage. Gages shall have operating-pressure and -temperature ranges so normal operating range is about 50 percent of full range.

C. Boiler Air Vent: Automatic.

D. Drain Valve: Minimum NPS 3/4 hose-end gate valve.

E. Safety Relief Valve:
   1. ASME rated.

   2. Size and Capacity: As required for equipment according to ASME Boiler and Pressure Vessel Code.
   3. Description: Fully enclosed steel spring with adjustable pressure range and positive shutoff; factory set and sealed.

F. Pressure Gage: Minimum 3-1/2-inch diameter. Gage shall have normal operating pressure about 50 percent of full range.

G. Water Column: Minimum 12-inch glass gage with shutoff cocks.

H. Drain Valves: Minimum NPS 3/4 or nozzle size with hose-end connection.

I. Blowdown Valves: Factory-installed bottom and surface, slow-acting blowdown valves same size as boiler nozzle.

J. Stop Valves: Boiler inlets and outlets, except safety relief valves or preheater inlet and outlet, shall be equipped with stop valve in an accessible location as near as practical to boiler nozzle and same size or larger than nozzle. Valves larger than NPS 2 shall have rising stem.

2.4 CONTROLS

A. The boiler shall have an integrated boiler control that is capable of operating the boiler and associated accessories including but not limited to: its pumps, valves and dampers.
   1. The control shall have a 5 inch color touch screen display as well as six function buttons that are separate from the display. User shall have the ability to navigate the menus via touchscreen or navigation buttons. Controls not equipped with navigation button options shall not be permitted.
   2. The control shall be equipped with a multi-color linear LED light to indicate the level of firing and/or air/fuel valve position.
   3. The control shall display two temperatures using two dedicated three-digit seven-segment displays.
   4. The control shall offer an Enable/Disable toggle switch as well as two buttons for Testing and Resetting the Low Water Cutoff.
   5. Software update: The control shall be capable of field software updates without a need for hardware component(s) replacement. This shall be performed either using software on a USB flash drive or via Internet connection. The software update mechanism shall be performed by a trained technician. The software update menus shall be secured using a password level. After the software update, the control shall retain all of its prior field settings.
   6. The control panel shall include:
      a. Setpoint High Limit: Setpoint high limit allows for a selectable maximum boiler outlet temperature and acts as temperature limiting governor. Setpoint limit is based on a PID function that automatically limits firing rate to maintain outlet temperature within a 0 to 10 degree selectable band from the desired maximum boiler outlet temperature.

b. Setpoint Low Limit: Allow for a selectable minimum operating temperature.
c. Failsafe Mode: Failsafe mode allows the boiler to switch its mode to operate from an internal setpoint if its external control signal is lost, rather than shut off. This is a selectable mode, enabling the control can to shut off the unit upon loss of external signal, if so desired.

E. The boiler control system shall incorporate the following additional features for enhanced external system interface:

1. System start temperature feature
2. Pump delay timer
3. Auxiliary start delay timer
4. Auxiliary temperature sensor
5. Analog output feature to enable simple monitoring of temperature setpoint, outlet temperature or fire rate
6. Remote interlock circuit
7. Delayed interlock circuit
8. Easy Setup by providing simplified menu quick settings to expedite plant and boiler setup
9. Delta-T Limiter
10. Freeze protection
11. Fault relay for remote fault alarm
12. Warm-weather shutdown

1. The control shall offer multi-level user security access using different passwords. For additional security, the passwords shall expire if control display was not touched for an extended period 30 minutes.

F. Building Automation: The control shall be able to communicate to Building Management Systems using BACnet and Modbus without the use of external gateways. The control shall be able to communicate over each of the two protocols using IP as well as RS485. The use of external gateways is not acceptable. The control shall be able to communicate to the building management system using:

1. BACnet MS/TP and BACnet IP/Ethernet. When communicating over BACnet IP, the control shall offer an additional layer of IP security by mapping all control BACnet IP communication to the BACnet server's IP and MAC addresses. Not having this level of security shall deem the IP communication insecure and shall not be acceptable.
2. Modbus RTU and Modbus IP.

G. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.

1. High Cutoff: Automatic reset stops burner if operating conditions rise above maximum boiler design temperature.

2. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be automatic reset type.

3. Auxiliary Low-Water Cutoff Switch: Float and electronic external listed ALWCO piped and wired to prevent burner operation on low water. Cutoff switch shall be manual reset type.

4. Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.

5. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.

2.5 ELECTRICAL POWER

A. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

1. House in NEMA 250, Type 1 enclosure.
2. Wiring shall be numbered and color-coded to match wiring diagram.
3. Install factory wiring outside of an enclosure in a metal raceway.
4. Field power interface shall be to circuit breaker.
5. Provide branch power circuit to each motor and to controls with a disconnect switch or circuit breaker.
6. Provide each motor with overcurrent protection.

2.6 VENTING

A. The boiler shall be capable of venting in Polypropylene venting material. The exhaust vent must be UL Listed for use with Category II, III and IV appliances and compatible with condensing flue gas service. UL-listed vents of Polypropylene or Al 29-4C stainless steel must be used with boilers.

B. Combustion-Air Intake: Boilers shall be capable of drawing combustion air from the outdoors via a metal or PVC duct connected between the boiler and the outdoors.

2.7 BURNER BOILER ACCESSORIES AND RELATED EQUIPMENT

A. Burner Emergency Switches: Surface mounted for existing construction or flush mounted with recessed box for new construction; all aluminum construction (NEMA 2, drip proof). Includes normally open switches rated for 10 amps at 125 VAC and engraved nameplate marked “TO STOP GAS BURNERS.”

1. Similar to “Class 9001” with “K-15” operator and “KA1” switch block(s) by Square D.

B. Condensate Control: Provide each boiler with F&T condensate trap and condensate neutralizing tank. One neutralizing tank per boiler or per boiler system will be acceptable. Neutralizing tank(s) size: larger of two gallons or 1.5 gallon per million BTU/hr boiler input capacity (volume measured below level of boiler condensate trap outlet). Condensate neutralizing tank constructed of 4” or 6” diameter schedule 40 PVC pipe assembly with threaded condensate inlet and outlet connections, a threaded side cleanout cover, and supports. Fill with appropriately sized limestone gravel. Provide limestone gravel as required to fill all neutralizing tanks, plus 5 gallons extra per boiler room; leave extra in lidded 5 gallon pail for

Owner's future use. Pipe neutralizing tank with unions for service removal, extend outlet to floor drain.

C. Gas Train Vent Terminations: Internally threaded 90 degree angle fitting of cast aluminum or malleable iron construction, with stainless steel insect (between 10 and 16 mesh) screening disc interference fit to elbow in such a manner as to disengage from fitting under blow off design back pressure, allowing full discharge. Free area through screening not be less than free area of required vent pipe size (reducing elbow required). Screen recessed from termination, forming an integral drip and paint protection edge.

2.8 SOURCE QUALITY CONTROL

A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.

B. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

C. Allow Owner access to source quality-control testing of boilers. Notify Architect 14 days in advance of testing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.

1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 BOILER INSTALLATION

A. Equipment Mounting: Install boilers on concrete equipment pad.

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floors and pads.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Coordinate sizes and locations of concrete bases with actual equipment provided.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Install gas-fired boilers according to NFPA 54.

C. Assemble and install boiler trim.

D. Install electrical devices furnished with boiler but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve.

D. Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service. Flexible connectors and their installation are specified in Division 23 Section "Hydronic Piping."

E. Connect gas piping to boiler through gas-train. Provide gas line to boiler full size as shown on drawings through drop with isolation valve then lateral tee then full size drip leg with removable cap. Lateral to boiler at least full size of gas train connection with manufacturer’s recommended straight run before and after auxiliary regulator then union located for optimum serviceability. Provide reducers as required.

F. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

G. Install piping from safety relief valves to nearest floor drain.

H. Boiler Venting:

1. Install flue venting kit and combustion-air intake.
2. Connect full size to boiler connections. Comply with requirements in Division 23 Section "Breechings, Chimneys, and Stacks."

I. Condensate control: Pipe all condensate from boiler condensate drains and breeching / chimney condensate and rain drains through appropriately sized traps, then neutralizing tank, to floor drain. Pipe acidic condensate in CPVC, protected from foot traffic by steel pipe sleeve outside carrier pipe, covered with yellow and black striped safety strips, secured to floor to prevent rolling.

J. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

K. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections, and to provide startup and commissioning service and reports. Start up to be performed only after complete boiler room operation is field verified to offer a substantial load, and complete system circulation. One-year warranty shall be handled by factory authorized tech.

B. Notify Architect minimum two weeks in advance of test dates.

C. Comply with performance requirements indicated, as determined by field performance tests.

1. Repeat tests until results comply with requirements indicated.

D. Provide analysis equipment required to determine performance.

E. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems and weather do not produce adequate demand.

F. Remove and replace malfunctioning components and/or complete units and retest as specified. Adjust, modify, or replace equipment to comply.

3.5 COMMISSIONING

A. Refer to 23 08 00 Commissioning of HVAC.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Video training sessions**.** Refer to Division 01 Section "Demonstration and Training."

3.7 WARRANTY PERIOD SERVICE

A. Provide factory authorized service for a minimum of one year from date established on certificate of substantial completion.

1. Provide service, including 24-hour emergency service, as required to maintain the boiler/burner system in optimum operating order.

2. Provide the services of a boiler manufacturer factory-employed and trained boiler and burner service and start-up technician for all regular scheduled service and maintenance

for the first year following substantial completion. In addition to initial start-up, provide full cleaning, tune up service, and combustion performance adjustment and re-testing within one month of the end of this one year service period. Boiler combustion and thermal performance at end of warrantee period tune up must be equal to or better than those set at initial start-up, with combustion reports printed directly off an electronic combustion analyzer. Provide adjustments, repairs, and replacements as required to return boiler to like new performance at this time, including all recommended replacement components.

3. Emergency Service: Provide one year emergency boiler / burner service. If factory employed service technician cannot arrive within 2 hrs of call, contract emergency burner service through an authorized local boiler / burner service organization who can and will respond within 2 hrs to any and all legitimate service calls on a 24 hour / seven day basis, with no charges to the Owner. Factory employed technician to follow-up within 48 hours to insure proper completion of emergency service.

END OF SECTION 23 52 16

SECTION 23 57 00 - HEAT EXCHANGERS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plate heat exchangers.

1.3 ACTION SUBMITTALS

A. Product Data: Include materials, rated capacities, operating characteristics, furnished specialties, and accessories, demonstrating quality and performance as scheduled and specified.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, center of gravity, loads, required service clearances, method of field assembly, details of support / anchorage, components, and location and size of each field connection.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For heat exchangers to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, performance, and dimensional requirements of heat exchangers and are based on the specific equipment indicated. Refer to Division 01 Section "Product Requirements."

B. ASME Compliance: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 BRAZED PLATE HEAT EXCHANGERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified:

1. Alfa Laval Thermal, Inc.
2. API Heat Transfer Inc.
3. Armstrong Pumps, Inc.
4. FlatPlate, Inc.
5. Invensys APV, Inc.
6. ITT Corporation; Bell & Gossett.
7. Mueller, Paul Company.
8. Polaris Plate Heat Exchangers.
9. Tranter, Inc.

B. Configuration: Brazed assembly consisting of two end plates, one with threaded nozzles and pattern-embossed thermal transfer plates arranged in a close contact counter-flow configuration.

C. End-Plate Material: Type 316 stainless steel.

D. Threaded Nozzles: Type 316 stainless steel.

E. Thermal Transfer Plates: double wall NSF rated for potable domestic hot water on heated side, with treated boiler water on the hot side, 0.024 inch thick before stamping; Type 316 or 316L stainless steel.

F. Brazing Material: Copper.

G. Provide configuration as required meeting capacity, pressure drops, connections, and other performance characteristics as scheduled.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.

B. Examine roughing-in for heat-exchanger piping to verify actual locations of piping connections before equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 HEAT-EXCHANGER INSTALLATION

A. Install heat exchangers on existing concrete base. Anchor heat exchanger frame to concrete base, and heat exchanger to frame.

1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Insulate heat exchangers as specified in section 23 07 00 – "HVAC Insulation".

3.3 CONNECTIONS

A. Coordinate piping installation and specialty arrangement requirements with schematics on Drawings and with requirements specified for piping systems.

1. Provide four valve reversing flush piping on both hot and heated sides of Heat Exchangers.

2. Provide hose end valves on heat exchanger side of main isolation valves, both heating and heated sides, arranged to drain, vent, and flush / descale heat exchanger.

3. Provide thermometers, P/T plugs, pressure gauges, and temperature sensor wells on heat exchangers as detailed and as described in section 23 05 19 – "Meters and Gauges for HVAC Systems".

B. Maintain manufacturer's recommended clearances for service and maintenance. Install piping connections to allow service and maintenance of heat exchangers.

C. Install shutoff valves in serviceable locations isolating heat exchanger specialties at each heat-exchanger inlet and outlet connection.

D. Install relief valves on hot side of both heating and heated-fluid connections and pipe relief valves, full size of valve connection, to floor drain.

E. Install hose end valve to drain low points.

3.4 FIELD QUALITY CONTROL

A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 CLEANING

A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

END OF SECTION 23 57 00

SECTION 23 64 26 - SCROLL WATER CHILLER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Packaged, air-cooled, electric-motor-driven, scroll water chiller.

1.3 DEFINITIONS

A. BAS: Building automation system, also known as Energy Management and Control System (EMCS).

B. EER: Energy-efficiency ratio. The ratio of the cooling capacity given in terms of Btu/h to the total power input given in terms of watts at any given set of rating conditions.

C. IPLV: Integrated part-load value. A single-number part-load efficiency figure of merit calculated per the method defined by AHRI 550/590 and referenced to AHRI standard rating conditions.

1.4 PERFORMANCE REQUIREMENTS

A. Cooling Performance Tolerance: In accordance with the AHRI-550/590 standard for each of the following:

1. Allowable Capacity.
2. Allowable EER.
3. Allowable IPLV.

B. Acoustic Performance: Certified in accordance with AHRI-370 standards, with data reported as absolute sound power generated by unit in each of 8 octave bands, and also in sound pressure reported directionally in dBA on each of four sides of unit at 30ft distance open field. Allowable tolerance:

1. Sound power in any octave band no greater than design make equipment.
2. Sound pressure on any side no greater than design make equipment.

1.5 ACTION SUBMITTALS

A. Product Data: Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.

B. Coordination Drawings: Submit plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from contract documents, chiller shop drawings, and field verification:

1. Structural support details.
2. Piping roughing-in and connection requirements and details.
3. Wiring roughing-in and connection requirements, including spaces reserved for electrical equipment.
4. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.

1.6 INFORMATIONAL SUBMITTALS

A. Certificates: For certification required in "Quality Assurance" Article.
B. Startup service reports.
C. Warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.8 QUALITY ASSURANCE

A. AHRI Certification: Certify chiller according to AHRI 590 certification program.

B. AHRI Rating: Rate chiller performance according to requirements in AHRI 550/590.

C. ASHRAE Compliance:

1. ASHRAE 15 for safety code for mechanical refrigeration.
2. ASHRAE 147 for refrigerant leaks, recovery, and handling and storage requirements.

D. ASME Compliance: Fabricate and label chiller to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, and include an ASME U-stamp and nameplate certifying compliance.

E. Comply with NFPA 70.

F. Comply with requirements of UL and UL Canada and include label by a qualified testing agency showing compliance.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Provide factory coil shipping covers at factory and keep in place until completion of installation.

B. Acceptance at Site: Do not deliver unit until approved by Architect.

C. Storage and Protection

1. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
2. Protect units from physical damage. Prevent freeze-up from any cause.

1.10 COORDINATION, SEQUENCING, AND SCHEDULING

A. Coordinate construction of other trades in area adjacent to machine to insure adequate clearances for operating and maintenance service.

B. Coordinate with Electric Work Prime Contractor to ensure electrical components are installed properly and timely to allow installation and timely start-up of chillers.

C. Coordinate sizes, locations, and anchoring attachments of structural-steel support, roof mounted support rails, vibration isolation mounting, roof curbs, and roof penetrations with actual equipment provided.

1.11 WARRANTY

A. Special Materials Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of chillers that fail in materials or workmanship within specified warranty period.

1. Extended warranties include the complete chiller, specifically including but not limited to, parts and labor for the following:

a. Complete refrigerant circuits, including compressors, piping, heat exchangers, and all specialties including refrigerant and oil charge and loss of charge for any reason.

b. Complete electrical power, control, and drive assemblies.

c. Complete heat rejection system with fans, airflow direction control, and non-refrigerant condenser coil components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PACKAGED, AIR-COOLED CHILLER

A. Design Basis: Daikin.

1. Acceptable manufacturers
   a. Carrier
   b. Daikin
   c. Johnson Controls/York
   d. Trane
   e. Smardt

B. Description: Factory-assembled and run-tested chiller complete with base and frame, condenser casing, compressors, compressor motors and motor controllers, evaporator, condenser coils, condenser fans and motors, electrical power, controls, and accessories.

1. Finish: Coat base, frame, and casing with a corrosion-resistant coating capable of withstanding a 500-hour salt-spray test according to ASTM B 117.

2. Sound-reduction package designed to reduce sound level without affecting performance and consisting of the following:

   a. Acoustic attenuation enclosure around compressors, with weatherproof nylon cover.
   b. Flexible connections and attenuation material applied to all suction and discharge refrigerant piping.
   c. Reduced-speed fans with acoustic treatment.

C. Compressors:

1. The compressors shall be sealed hermetic, scroll type with crankcase oil heater and suction strainer. The compressor motor shall be refrigerant gas cooled, high torque, hermetic induction type, two-pole, with inherent thermal protection on all three phases and shall be mounted on RIS vibration isolator pads. The compressors shall be equipped with an internal module providing compressor protection and communication capability.

D. Evaporator:

1. The evaporator shall be a compact, high efficiency, dual circuit, brazed plate-to-plate type heat exchanger consisting of parallel stainless steel plates. Vent and drain connections shall be provided in the inlet and outlet chilled water piping by the installing contractor.

2. The evaporator shall be protected with an external, electric resistance heater plate. The evaporator and suction piping to the compressors shall be insulated with 3/4” (19 mm) thick CFC and HCFC-free closed-cell flexible elastomeric foam insulation material with 100% adhesive coverage. The insulation shall have an additional outer protective layer of 3mm thick PE embossed film to provide superior damage resistance. Insulation without the protective outer film shall not be acceptable. UV resistance level shall meet

or exceed a rating of 'Good' in accordance with the UNI ISO 4892 - 2/94 testing method. This combination of a heater plate and insulation shall provide freeze protection down to -20°F (-29°C) ambient air temperature.

3. The water-side maximum design pressure shall be rated at a minimum of 435 psig. Evaporators shall be designed and constructed according to, and listed by Underwriters Laboratories (UL).

E. Condenser:

1. Condenser fans shall be propeller type arranged for vertical air discharge and individually driven by direct-drive fan motors. The fans shall be equipped with a heavy-gauge vinyl-coated fan guard. Fan motors shall be TEAO type with permanently lubricated ball beAHRIngs, inherent overload protection, three-phase, direct-drive, 1140 rpm. Each fan section shall be partitioned to avoid cross circulation.

2. Coil shall be microchannel design and shall have a series of flat tubes containing multiple, parallel flow microchannels layered between the refrigerant manifolds. Tubes shall be 9153 aluminum alloy. Tubes made of 3102 alloy or other alloys of lower corrosion resistance shall not be accepted. Coils shall consist of a two-pass arrangement. Each condenser coil shall be factory leak tested with high-pressure air under water. Coils shall withstand 1000+ hour acidified synthetic sea water fog (SWAAT) test (ASTM G85-02) at 120°F (49°C) with 0% fin loss and develop no leaks.

F. Refrigerant Circuit:

1. Each of the two refrigerant circuits shall include a replaceable-core refrigerant filter-drier, sight glass with moisture indicator, liquid line solenoid valve (no exceptions), expansion valve, and insulated suction line.

G. Control System:

1. A centrally located weatherproof control panel shall contain the field power connection points, control interlock terminals, and control system. Box shall be designed in accordance with NEMA 3R rating. Power and starting components shall include factory circuit breaker for fan motors and control circuit, individual contactors for each fan motor, solid-state compressor three-phase motor overload protection, inherent fan motor overload protection and two power blocks (one per circuit) for connection to remote, contractor supplied disconnect switches. Hinged access doors shall be lockable. Barrier panels or separate enclosures are required to protect against accidental contact with line voltage when accessing the control system.

2. Shall include optional single-point connection to a non-fused disconnect switch with through-the-door handle and compressor circuit breakers.

H. Unit Controller:

1. An advanced DDC microprocessor unit controller with a 5-line by 22-character liquid crystal display provides the operating and protection functions. The controller shall take

preemptive limiting action in case of high discharge pressure or low evaporator pressure. The controller shall contain the following features as a minimum:

a. The unit shall be protected in two ways: (1) by alarms that shut the unit down and require manual reset to restore unit operation and (2) by limit alarms that reduce unit operation in response to some out-of-limit condition. Shut down alarms shall activate an alarm signal.

b. Shutdown Alarms

1) No evaporator water flow (auto-restart)
2) Sensor failures
3) Low evaporator pressure
4) Evaporator freeze protection
5) High condenser pressure
6) Outside ambient temperature (auto-restart)
7) Motor protection system
8) Phase voltage protection (Optional)

c. Limit Alarms

1) Condenser pressure stage down, unloads unit at high discharge pressures.
2) Low ambient lockout, shuts off unit at low ambient temperatures.
3) Low evaporator pressure hold, holds stage #1 until pressure rises.
4) Low evaporator pressure unload, shuts off one compressor.

d. Unit Enable Section

1) Enables unit operation from either local keypad, digital input, or BAS

e. Unit Mode Selection

1) Selects standard cooling, ice, glycol, or test operation mode

f. Analog Inputs:

1) Reset of leaving water temperature, 4-20 mA
2) Current Limit

g. Digital Inputs

1) Unit off switch
2) Remote start/stop
3) Flow switch
4) Motor protection

h. Digital Outputs

1) Shutdown alarm; field wired, activates on an alarm condition, off when alarm is cleared
2) Evaporator pump; field wired, starts pump when unit is set to start

i. Condenser fan control - The unit controller shall provide control of condenser fans based on compressor discharge pressure.

j. Building Automation System (BAS) Interface

1) Factory mounted DDC controller(s) shall support operation on a BACnet® network via one of the data link / physical layers listed below as specified by the successful Building Automation System (BAS) supplier.

2) BACnet MS/TP master (Clause 9)

3) BACnet IP, (Annex J)

4) BACnet ISO 8802-3, (Ethernet)

5) The information communicated between the BAS and the factory mounted unit controllers shall include the reading and writing of data to allow unit monitoring, control and alarm notification as specified in the unit sequence of operation and the unit points list.

6) All communication from the chiller unit controller as specified in the points list shall be via standard BACnet objects. Proprietary BACnet objects shall not be allowed. BACnet communications shall conform to the BACnet protocol (ANSI/ASHRAE135-2001). A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided along with the unit submittal.

I. Options and Accessories:

1. Ground Fault Protection: Factory installed circuit breaker to protect equipment from damage from line-to-ground fault currents less than those required for conductor protection.

2. Phase loss with under/over voltage protection and with LED indication of the fault type to guard against compressor motor burnout.

3. BAS interface module to prove interface with the BACnet MSTP protocol.

4. Rubber-in-shear vibration isolators for field installation

5. Factory-mounted thermal dispersion type flow switch

6. Wye strainer, to be installed at the evaporator inlet and sized for the design flow rate , with perforation diameter of 0.063" with blowdown valve and Victaulic couplings (factory mounted or field installed)

7. 115V GFI convenience outlet

J. Refrigerant Circuits:

1. Refrigerant: As indicated on Drawings.

2. Classified as Safety Group A2L according to ASHRAE 34.

3. Refrigerant Compatibility: Chiller parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.

4. Refrigerant Circuit: Each shall include a thermal- or electronic-expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.

5. Pressure Relief Device:

   a. Comply with requirements in ASHRAE 15 and in applicable portions of ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
   b. ASME-rated, spring-loaded pressure relief valve; single- or multiple-reseating type.

6. Control Transformer: Unit-mounted transformer with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.

   a. Power unit-mounted controls where indicated.
   b. Power unit-mounted, ground fault interrupt (GFI) duplex receptacle.

7. Control Relays: Auxiliary and adjustable time-delay relays.

8. For chiller electrical power supply, indicate the following:

   a. Current and phase to phase for all three phases.
   b. Voltage, phase to phase, and phase to neutral for all three phases.
   c. Three-phase real power (kilowatts).
   d. Three-phase reactive power (kilovolt amperes reactive).
   e. Original power factor, correction capacitor specifications, and corrected power factor.
   f. Running log of total power versus time (kilowatt-hours).
   g. Fault log, with time and date of each.

K. Capacities and Characteristics as scheduled.

2.2 SOURCE QUALITY CONTROL

A. Perform functional tests of chiller before shipping.

B. Factory run test each air-cooled chiller with water flowing through evaporator.

C. Factory performance test air-cooled chiller, before shipping, according to AHRI 550/590.

1. Test the following conditions:

   a. Design conditions indicated.
   b. Reduction in capacity from design to minimum load in steps of 25% with condenser air at design conditions.

2. Prepare test report indicating test procedures, instrumentation, test conditions, and results. Submit copy of results within one week of test date.

D. Air-cooled chiller shall have acoustic sound power and sound pressure level performance certified in accordance with AHRI 370.

1. Report calculations at the following conditions:

a. Design conditions indicated.
b. Chiller operating at calculated worst-case sound condition.
c. At two point(s) of varying part-load performance to be selected by Owner at time of test.

E. Factory test and inspect evaporator and condenser according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine chiller before installation. Document any damage with Owner prior to proceeding with installation work. Damage subsequent to joint inspection shall be the responsibility of the contractor.

B. Examine roughing-in for equipment support, anchor-bolt sizes and locations, piping, and electrical connections to verify actual locations, sizes, and other conditions affecting chiller performance, maintenance, and operations before equipment installation.

1. Final chiller locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CHILLER INSTALLATION

A. Install chiller on support structure indicated.

B. Maintain manufacturer's recommended clearances for service and maintenance.

C. Install separate devices furnished by manufacturer and not factory installed.

D. Connections:

1. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems.

2. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping". Drawings indicate general arrangement of piping, fittings, and specialties.

3. Install piping adjacent to chiller to allow service and maintenance.

4. Evaporator Fluid Connections: Connect to evaporator inlet with shutoff valve, strainer, flexible connector, thermometer, and plugged tee with pressure gage. Connect to evaporator outlet with shutoff valve, balancing valve, flexible connector, flow switch, thermometer, plugged tee with shutoff valve and pressure gage, and drain connection with valve. Make connections to chiller with a flange or mechanical grooved coupling. Include full size chiller bypass with valve.

5. Connect each chiller drain connection with a union and drain pipe, and extend pipe, full size of connection, to glycol fill station. Provide a shutoff valve at each connection.

6. Extend relief piping from outlet of evaporator pressure relief device full size of connection to glycol fill station.

E. Attend and video record the factory representative's demonstration and training sessions. Turn over high quality video recordings of training session, showing detailed sharp images pertinent to all of the training in question.

3.3 STARTUP SERVICE

A. Coordinate with the factory-authorized service representative who will perform the following startup service:

1. Complete installation and startup checks according to manufacturer's written instructions.

2. Verify that refrigerant charge is sufficient, and chiller has been leak tested. Charge chiller with refrigerant and fill with oil if not factory installed.

3. Verify that pumps are installed and functional.

4. Verify that thermometers and gages are installed.

5. Operate chiller for run-in period.

6. Check bearing lubrication and oil levels.

7. Verify that refrigerant pressure relief device is properly vented outdoors.

8. Verify proper motor rotation.

9. Verify static deflection of vibration isolators, including deflection during chiller startup and shutdown.

10. Verify proper integration with building energy management and controls system. Recommend and confirm proper integration of all control point data required for Owner's and Service Technician's diagnostic and control strategies.

11. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assembly, installation, and connection.

C. Inspect insulation on all cold surfaces for condensation. Repair and/or provide additional insulation as specified and as required to eliminate all surface condensation under operating conditions.

D. Prepare test and inspection startup reports.

E. Demonstration

1. Train Owner's maintenance personnel to adjust, operate, and maintain chiller.

END OF SECTION 23 64 26

SECTION 26 05 00.01 – COMMON WORK FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section and to all of Divisions 26.

1.2 SUMMARY

A. Section Includes:

1. General requirements applicable to components and systems included in Electric Contract.

B. Products Installed but Not Furnished Under This Section

1. Make electrical connections to equipment shown on Drawings and furnished by other Contractors. Obtain approved wiring diagrams and location drawings for roughing in and final connections from Contractor furnishing equipment.

1.3 REFERENCES

A. IBC International Building Code
B. IEEE Institute of Electrical and Electronics Engineers, Inc. (The)
C. IES Illuminating Engineering Society of North America
D. NEC National Electrical Code
E. NEMA National Electrical Manufacturers' Association
F. NETA International Electrical Testing Association
G. NFPA National Fire Protection Association
H. UL Underwriters' Laboratories, Inc.

1.4 SYSTEM DESCRIPTION

A. Design Requirements - Provide complete systems, properly tested, balanced, and ready for operation including necessary details, items and accessories although not expressly shown or specified, including (but not limited to):

1. Wiring and raceway for work specified in Project Manual and shown on Drawings.
2. Electrical devices and equipment for work specified in Project Manual and shown on Drawings.

B. Electric Layouts: Arrange panels; disconnect switches, enclosed breakers, equipment, raceways, and similar components neatly, orderly and symmetrically. Arrangements shown on

Drawings are diagrammatic only; provide and adjust raceways, wiring, and other components as required.

1. Power Interruptions and Scheduled Outages: Coordinate scheduling of all power interruptions and outages with Owner.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for items listed below:. Include ratings, and furnished specialties and accessories.

1. Enclosed switches and circuit breakers

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Codes and Standards: Comply with applicable Federal, State and local building and electrical codes, laws, ordinances, and regulations, and comply with applicable NFPA, National Electrical Code and utility company requirements and regulations. Provide Underwriters Laboratories Seal on all materials.

2. Permits and Inspections: Obtain approvals, tests, and inspections required by Architect, Engineer, local electrical inspector, agent or agency specified in Project Manual, or National, State, or local codes and ordinances.

3. Schedule electrical inspection by an agency acceptable to the local authority having jurisdiction and submit final inspection certificate to Architect.

4. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

1.7 ALTERATION PROCEDURES

A. In locations where existing devices are indicated to be disconnected and removed and existing power circuit or communications cable is not scheduled to be reused:

1. Remove circuit conductors back to source.

2. Modify panel directory for that circuit.

3. Remove all existing exposed and unexposed accessible raceway.

4. Provide blank cover plates or wall infill (as indicated on plans) and as described below:

a. For single gang and multi-gang switch boxes in public or occupied spaces; stainless steel coverplates.

b. For single gang and multi-gang boxes in un-occupied spaces; stainless steel, galvanized steel or PVC coverplates.

c. For boxes larger than standard switch boxes in public or occupied spaces; remove existing box and provide wall infill, matching existing sub-surface and finished surface conditions. Paint wall to match surrounding finishes.

d. For boxes larger than standard switch boxes in un-occupied spaces; 18 gage galvanized sheet metal coverplate with machined edges. Prime and paint to match surrounding finish conditions.

5. Patch and paint existing walls where disturbed by the electrical work.

B. In locations where existing devices are to remain in place, ensure circuits feeding such devices remain operational. Modify existing circuits as required to allow new construction to occur and to maintain necessary circuitry to existing devices for complete and proper operation.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Conductors: Copper complying with NEMA WC 70/ICEA S-95-658.

1. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2 and Type XHHW-2.

B. Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

A. Conductors No. 8 AWG and smaller: Screw on, wing nut wire connectors with fixed square wire threads and wide throated skirt. UL 486C Listed.

B. Conductors No. 6 AWG to 3/0 AWG: Bolt on type or crimped type compression, seamless copper connectors using hand or hydraulic tool, color coded to wire size. Connector shall be electro-tin plated to resist electrolytic corrosion. UL 486A and UL 486B Listed.

C. Conductors No. 4/0 AWG and larger: Compression type solderless connector, long barrel seamless copper with minimum 2 pressure points per conductor. Fully compatible with industry standard crimping tool-die sets. Color coded to wire size and electro-tin plated to resist electrolytic corrosion. UL 486A Listed.

2.3 METAL CONDUIT, TUBING AND FITTINGS

A. Galvanized Rigid Steel Conduit (GRC): Rigid, hot dipped galvanized steel with galvanized threaded malleable iron fittings and bushings with insulated throat (galvanized steel). ANSI C80.1 and UL 6.

B. Electrical Metallic Tubing (EMT): Metallic galvanized steel tube with galvanized steel compression or setscrew type fittings and bushings with insulated throat (galvanized steel). ANSI C80.3 and UL 797.

C. Flexible Metal Conduit (FMC): Flexible, interlocked aluminum metal strip with galvanized screw-in type steel fittings. UL 1.

D. Liquid Tight Flexible Metal Conduit (LFMC) : Liquid-tight flexible metal raceway with single, flexible, continuous, interlocked and double-wrapped steel core galvanized inside and outside, coated with liquid tight jacket of flexible polyvinyl chloride (PVC). UL 360.

E. Fittings:

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.

2. Fittings for EMT:

a. Material: Steel .
b. Type: Set screw or compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

2.4 NONMETALLIC CONDUIT AND TUBING

A. RNC: NEMA TC 2, UL 651,Type EPC-40-PVC**,** with matching fittings by same manufacturer as the conduit.
B. ENT: Comply with NEMA TC 13 and UL 1653.
C. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
D. LFNC: UL 1660.
E. Fittings for LFNC: UL 514B.
F. Solvents and Adhesives: As recommended by conduit manufacturer.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Outlet Boxes

1. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

2. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy**,** Type FD, with gasketed cover.

3. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

4. Materials

a. Recessed Applications and Exposed Applications in Unfinished Spaces: Galvanized, stamped steel.

b. Boxes in stud walls shall be 4" square, 2 1/8" deep boxes with raised covers for power circuits. Provide "Far-Side" box support to keep box alignment parallel with wall face.

c. Boxes in masonry walls shall be 3 ½" deep masonry boxes, single or multigang as required

d. Exposed Applications: In finished spaces requiring exposed applications, provide boxes to match surface raceway system. In situations where surface mount conduits are allowed, condulet style boxes shall be used.

e. Concrete and Wall in Wet Locations: Heavy duty cast aluminum, thermoset protective silver grey finish, with threaded mounting posts.

f. Weatherproof Outlet Boxes: Corrosion-resistant cast metal weatherproof outlet wiring boxes of appropriate type, shape, size and depth, with threaded conduit ends and cast metal face plates with cover suitably configured for each application, including face plate gaskets and corrosion resistant fasteners. Do not compromise outlet weatherproof integrity when attachment plug is inserted.

g. Junction and Pull Boxes: Galvanized code gauge sheet steel boxes with screw-on covers, of appropriate type, shape and size suitable for box location and installation with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

5. Covers: Design and style for each type, outlet, junction box, etc.; NEMA rated for each location.

2.6 MOLDED-CASE CIRCUIT BREAKER SWITCHES

A. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

B. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

2.7 ENCLOSED SWITCH AND CIRCUIT BREAKER ENCLOSURES:

A. NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

A. Furnish and install sleeves, inserts, panels, raceways, boxes, and similar infrastructure., ahead of general construction work and maintain Contractor personnel at Site during installation of general construction work to be responsible for and to maintain these items in position.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders and Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway**.**

C. Exposed Branch Circuits and Concealed Branch Circuits in Concrete, below Slabs-on-Grade, Underground, in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Wire and Cable Installation: Install all wire and cable in approved raceway; with exit light circuits, emergency lighting circuits, and special systems wiring installed in separate raceways. Use UL approved lubricants for wire pulling. Tag all feeders, subfeeders, special system wiring and branch circuit wiring at each pull box, junction box, and gutter space indicating point of origin and termination. Install green grounding wire in all raceways for connection to equipment, motors, transformers, and similar equipment.

B. Splices and Terminations: Make all splices accessible. Insulate all splices, taps, and connections to insulation value of conductor. Terminate low voltage cables with termination blocks.

C. Common Neutral Conductor: Do not use common neutral for multiple branch circuits.

D. Replace wiring damaged during installation.

E. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

F. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

G. Metal Clad Type "MC" Cable:

1. Install MC cable, parallel and perpendicular to surfaces or structural members following surface contours, where possible.
2. Do not use MC cable for home runs (from panel to first device in branch circuit).
3. Do not penetrate floor slabs with MC cable.

4. Metal clad cable may be used for switch, receptacle, light fixture, device and fixture branch circuit wiring above ceilings and in walls beyond corridor walls.
5. MC cable shall include a neutral, whether used or not, to a light switch location.
6. Above corridor ceilings, use MC cable for 6 foot light fixture whips.

H. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

I. Provide insulated, green, copper equipment ground conductor for each branch and feeder circuit.

3.4 RACEWAY APPLICATION

A. Raceway Installation: Securely support raceway from building construction, separately from outlet boxes and junction boxes. Secure to masonry surfaces with expansion anchors. Use galvanized hanger rods, inserts and hangers. Conceal all raceway runs except in mechanical rooms, storage room ceilings, and areas above suspended ceilings. Run exposed raceway neatly, parallel and level, to ceilings, walls and floors. Make necessary offsets and bends to comply with construction. Install expansion fittings at all building expansion joints. Support all raceways with clamps per National Electric Code

1. GRC Installation: Use GRC in concrete slabs, below concrete slabs, below grade, damp locations, exterior locations and in hazardous locations. Where exposed leaving concrete slabs, extend minimum 6 inches above and below slabs. Use GRC elbows when penetrating concrete slab from PVC raceway below or in slabs.

2. RNC: Use for underground applications, in slabs, and below slabs. Provide rigid raceway when extending through slabs. Install in accordance with requirements of Article 352 of NEC. Make solvent-cemented joints in accordance with recommendations of manufacturer.

3. EMT: Use EMT for non-hazardous, dry locations above grade. As a minimum, use EMT in corridor ceilings, for home runs and in all unoccupied exposed interior areas. Surface mounted EMT shall not be used in finished areas without written permission from the Architect or Owner.

4. FMC: Use flexible metal conduit for final connections to motors, step-down transformers, vibrating machines, etc. Terminate with clamp type connectors and anti-short bushing. Maximum length of three feet.

5. LFMC: Use a maximum of six feet of liquid tight flexible conduit for connection of motors and for other electrical equipment where subject to movement and vibration. Do not install in length long enough to require support from structure. Adjust stated conductor size to correspond with temperature rating of selected LFMC.

B. Minimum Raceway Size: 1/2-inch (16-mm)

C. Surface Raceways: Use surface raceways in finished spaces to conceal new cabling that cannot be installed above accessible ceiling or within walls. Use surface raceway only when raceway type and routing are approved by Architect and Owner’s representative.

3.5 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.

2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.

3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

4. Provide underground warning tape, installed approximately 12 inches above conduits.

3.6 WIRING DEVICE INSTALLATION

A. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.

B. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

C. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

D. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.

E. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.

F. Use a torque screwdriver when a torque is recommended or required by manufacturer.

G. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

H. Tighten unused terminal screws on the device.

I. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

END OF SECTION 26 05 00.01

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above and below-grade site improvements.
6. Disconnecting, capping or sealing, removing site utilities, and abandoning site utilities in place.
7. Temporary erosion and sedimentation-control measures.
8. Disposal of waste material.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil (insitu): Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS, GENERAL

A. General: Submit all informational submittals required by this Section concurrently.

1.6 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video.

1.7 CLOSEOUT SUBMITTALS

A. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.8 PROJECT CONDITIONS

A. Verification of Conditions: Examine conditions under which site clearing is to be accomplished and notify Architect in writing of any conditions detrimental to proper and timely accomplishment. Do not proceed with site clearing until unsatisfactory conditions have been corrected.

B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.

3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

H. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #79, Alkyd Anticorrosive Metal Primer or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 EXISTING UTILITIES

A. **Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.**

1. **Verify that utilities have been disconnected and capped before proceeding with site clearing**.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed [**or abandoned in place**].

Retain one of two subparagraphs below.

1. **[Arrange with utility companies to shut off indicated utilities.]**
2. **[Owner will arrange to shut off indicated utilities when requested by Contractor.]**

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify **[Construction Manager] [Architect]** not less than [**ten working days**] <**Insert number**> days in advance of proposed utility interruptions.

Retain one of two paragraphs below, depending on project scope.

E. **[Excavate for and remove underground utilities indicated to be removed.]**

F. **[Coordinate removal of underground utilities with applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security and utilities sections and Section 02 41 16 "Structure Demolition" and Section 02 41 19 "Selective Structure Demolition".]**

G. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer in accordance with Section 31 20 00 "Earth Moving".

3.3 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Do not remove surplus topsoil from site.

D. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.

3.4 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction including foundations, slabs, paving, curbs, gutters, retaining walls, aggregate base and other improvements.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically. Leave cut edge neat and square where existing material is cut to adjoin new work.
2. Remove asphalt concrete paving material to full depth and remove from site. Do not use asphalt materials for on-site fill.
3. Gravel and stone fill under removed sidewalks may be reused if suitable for the particular new use and if approved by the Architect.
4. Break up and completely remove miscellaneous concrete, such as small foundations. Remove concrete, retaining walls or foundations below grade to a minimum depth of 2’.
5. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.5 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 10 00

SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade and turf and grasses.
2. Structural Fill: For backfill under structures, pavements, concrete pads, etc.
3. Granular Fill: Sub base for interior concrete slabs-on-grade, asphalt paving, concrete paving, etc.
4. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 01 32 00 - Construction Progress Documentation
2. Section 01 32 33 - Photographic Documentation
3. Section 03 30 53 – Miscellaneous Cast-in-Place Concrete
4. Section 31 10 00 - Site Clearing
5. Section 32 92 00 - Turf and Grasses

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Subbase: Granular aggregate layer supporting the slab-on-grade and pavement that also minimizes upward capillary flow of pore water.

G. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Geotechnical Engineer.

2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Geotechnical Engineer or Architect. Unauthorized excavation, as well as remedial work directed by Geotechnical Engineer or Architect shall be without additional compensation.

H. Fill: Soil materials used to raise existing grades.

I. Hazardous Soil Materials: Soils that are contaminated with petroleum product and/or hazardous chemicals, waste or industrial waste.

J. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Rock Excavation: Track-mounted excavator rated at not less than 222-hp flywheel power with weight of 70,000 lbs or greater and a 30-in wide short-tip radius rock bucket. (Ratings are based on Caterpillar's "Model No. 330B".)

K. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below aggregate base, structural fill, drainage fill, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

N. Non-Granular Fill: Soil fill material used to raise existing grades in areas that do not require granular or structural fill.

O. Well-Graded: Soils containing a good range of all representative particle sizes between the largest and the smallest. All sizes must be represented, and no one size should be either overabundant or missing.

P. Poorly-Graded: Soils which either contain a narrow range of particle sizes or have some intermediate sizes lacking.

1.4 SUBMITTALS

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

B. Action Submittals:

1. Product Data: For each type of the following manufactured products required:

   a. Geotextiles.
   b. Warning tapes.

2. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

   a. Classification according to ASTM D 2487.
   b. Laboratory compaction curve according to ASTM D 1557.
   c. Submitted material testing and analysis shall demonstrate that no unsuitable soil groups are present.
   d. Submitted material testing and analysis shall demonstrate that no absorbent clays are present.

3. Verification of Conditions: Written confirmation from installer that installation of Earthwork Materials installed in accordance with specifications.

C. Informational Submittals:

1. Qualification Data: For qualified testing agency.

2. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, which might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Qualified Installers as defined below:

1. Earthwork Contractor Experience Requirements: Provide a list of at least four Earthwork projects of comparable size, scope, and quality completed successfully by the proposed Sub Contractor within the past two years that includes the date completed, project Owner’s name and current contact information, including telephone numbers and e-mail addresses.

B. Civil/Structural Preconstruction Conference: Attend Civil/Structural Preconstruction Conference.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

C. Do not commence earth moving operations until temporary and permanent erosion- and sedimentation-control measures, specified in Division 31 Section "Erosion and Sedimentation Control" are in place.

D. Do not commence earth moving operations until plant-protection measures specified in Division 31 Sections "Erosion and Sedimentation Control" and "Site Clearing" are in place.

E. The following practices are prohibited within tree- or plant-protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
8. Directing vehicle or equipment exhaust towards protection zones.
9. Heat sources, flames, ignition sources, and smoking within or near protection zones.

F. Existing Hazardous Materials:

1. If during the performance of the work suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. If present, hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Materials:

1. General: Provide imported soil materials when sufficient satisfactory soil materials are not available from onsite excavations.
2. Topsoil: Refer to Turf and Grasses Specification, Division 32.

B. Hazardous Materials:

1. Provide fill materials that are not contaminated with petroleum product, hazardous waste or industrial waste.
2. Contamination above federal, state or local requirements is not acceptable. Materials with a visible sheen or petroleum odor shall be rejected.

C. Unsuitable Soils: (Includes excavated native and imported non-granular, granular and structural fill materials)

1. Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

    a. Soils Materials shall not contain any absorbent aluminum phyllosilicates, including but not limited to: bentonite (sodium, calcium, or potassium), tonstein, montmorillonite, kaolinite. or other absorbent clays.

2. Unsuitable soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
3. Submitted material testing and analysis shall demonstrate that material classification meets ASTM-D2487 USC system criteria and that no unsuitable soil groups, or absorbent clays are present.

D. Non-Granular Fill: Material is to comply with NYSDOT requirements for Select Borrow and Select Fill with modifications shown below. This material is not allowed in areas where granular soils are required, including within the building footprint, below pavement areas or below a synthetic turf athletic field.

1. On-Site Non-Granular Fill

    a. Submittal must be provided demonstrating that on-site soil material meets the criteria outlined in this Section for use as fill material.
    b. Obtain approval of Architect before proceeding with use of on-site material.
    c. Material is to have no particles greater than 3” in maximum dimension, no more than 70% by weight passing the #40 sieve and no more than 20% passing the #200 sieve.
    d. Testing submitted is to demonstrate that proper compaction can be achieved as required in Part 3, Execution.

2. Imported Non-Granular Fill

    a. Where quantity of approved non-granular fill materials required exceeds that available from on-site stock-piles, provide suitable material from off-site sources.
    b. Obtain approval of Architect before proceeding with use of imported fill material.
    c. Material is to have no particles greater than 3” in maximum dimension, no more than 70% passing by weight the #40 sieve and no more than 15% passing the #200 sieve.
    d. Testing submitted is to demonstrate that proper compaction can be achieved as required in Part 3, Execution.

E. Structural Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand.

1. Type 1 Fill (NYSDOT ITEM No. 304.11 Granular Fill) gradation requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieves
3 inch	100
2 inch	90 to 100
1/4-inch	30 to 65
#40	5 to 40
#200	0 to 10

F. Granular Fill: Import all granular fill types from off-site sources. Granular fill consists of stone, sand, and gravel, or blends of these materials, free of slag, complying with New York State Department of Transportation (NYSDOT) Standard Specification, Section 304, as modified below:

1. Type 2 Fill (NYSDOT ITEM No. 304.12 / Crushed / Blasted Ledge Rock Stone) Gradation Requirements.

Sieve Designation	Percent by Weight Passing Square Mesh Sieves
2 inch	100
1/4-inch	25 to 60
#40	5 to 40
#200	0 to 10

2. Type 4 Fill (NYSDOT ITEM No. 304.14 / Select Granular Fill) Gradation Requirements.

Sieve Designation	Percent by Weight Passing Square Mesh Sieves
2 inch	100
1/4-inch	30 to 65
#40	5 to 40
#200	0 to 10

G. Crushed Stone: Crushed stone to complying with New York State Department of Transportation (NYSDOT) Standard Specifications, Section 703-0201 which is product of mechanical crushing. Where indicated, provide the following fill materials, consisting of clean, free of slag, durable, sharp-angled fragments of rock of uniform quality. The crushed stone used as coarse aggregate for all items shall be obtained from sources conforming to the requirements of the NYSDOT as to sampling, testing methods, Quarry Reports and any other required procedures and complying with following requirements:

1. NYSDOT No. 1 Crushed Stone Gradation Requirements (NYSDOT 703-4 # 1 Stone):

Sieve Designation	Percent by Weight Passing Square Mesh Sieves

1 inch	100
1/2-inch	90 to 100
1/4-inch	0 to 15
#200	0 to 1

2. NYSDOT No. 2 Crushed Stone Gradation Requirements (NYSDOT 703-4 #2 Stone):

Sieve Designation	**Percent by Weight Passing Square Mesh Sieves**
1-1/2 inch	100
1 inch	90 to 100
1/2-inch	0 to 15
#200	0 to 1

H. Drainage Fill: Mixture of 50 percent NYSDOT No. 1 crushed stone and 50 percent NYSDOT No. 2 crushed stone, complying with New York State Department of Transportation Standard Specifications, Section 703-02.

Sieve Designation	**Percent by Weight Passing Square Mesh Sieves**
1-1/2 inch	100
1 inch	95 to 100
1/2-inch	25 to 60
# 4	0 to 10
# 8	0 to 5

I. Sand for general use and/or utility bedding: ASTM C 33; fine aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine conditions under which earthwork is to be accomplished in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors and Architect in writing of any conditions detrimental to proper and timely accomplishment. Do not proceed with earthwork until unsatisfactory conditions have been corrected in manner acceptable to Installer.

1. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Architect written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

1. Contractor is entirely responsible for strength and adequacy of bracing and shoring, and for safety and support of construction from damage or injury caused by lack of adequate protection or by movement or settlement.

2. Contractors are advised that they are required to comply with Occupational Safety and Health Administration's (OSHA) standards pertaining to excavation.

3. All excavations must be barricaded at all times using either traffic or A-Frame type barricades. Gaps between barricades may be up to 6-inches wide and must be blocked with caution tape.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.3 UNDERGROUND UTILITY SURVEY

A. An underground utility survey must be conducted prior to the start of any excavation. Call 811

3.4 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.5 EXPLOSIVES

A. Explosives: Do not use explosives.

3.6 SITE CLEARING

A. Refer to Division 31 Section "Site Clearing".

3.7 EXCAVATION, GENERAL

A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Geotechnical Engineer. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

    a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock (refer to Definitions section: "Rock" paragraph above). Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

    a. 24 inches outside of concrete forms other than at footings.
    b. 12 inches outside of concrete forms at footings.
    c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    e. 6 inches beneath bottom of concrete slabs-on-grade.
    f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.8 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 6 inches (150 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe. Remove projecting stones and sharp objects along trench subgrade.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots in accordance with standard nursery practice and Division 31 Section “Erosion and Sedimentation Control”.

3.9 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Geotechnical Engineer determines that unsuitable soil is present, continue excavation and replace with compacted backfill or fill material as directed.

3.10 PROOF-ROLLING

A. Proof-roll subgrade below building slabs, concrete pads and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction and repeating proof-rolling in direction perpendicular to first direction with a minimum of six overlapping passes. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsuitable soils, and areas of excessive pumping or rutting, as identified by Geotechnical Engineer and as directed by Owner, and replace with compacted backfill or fill as directed. Notify Architect in writing of any required remediation.
3. Foundations: Proof-roll prior to excavation for foundations but after top soil is stripped.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities without additional compensation.

3.11 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. CLSM (flowable fill), per this specification section, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit in accordance with this Section unless otherwise directed by Geotechnical Engineer.

3.12 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.13 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.14 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section **Miscellaneous Cast-in-Place Concrete**.

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

I. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.15 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows. Refer to Part 2 for material requirements and specific conditions for the use of each type of soil material. All fill materials to be approved by Architect per requirements noted in Part 2.

1. Under grass and planted areas:
    a. Use satisfactory non-granular fill material.
2. Under walks, pavements and exterior slabs:
    a. Use Structural Fill below subbase layer and Type 2 granular fill for subbase layer.
3. Under footings and foundations:
    a. Use structural fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.16 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry density.

3.17 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Maximum layer depth before compaction:

1. Under Pavement: Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
2. Place backfill and fill soil materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 8 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry weight density according to ASTM D 1557:

1. Under structures, building slabs, steps, synthetic turf and pavements**.**

a. Scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

2. Under natural turf or unpaved areas:

a. Compact each layer of subgrade backfill or fill soil material at 85 percent. Compact all layers beneath the upper 2'-0" to at least 95 percent.

3. Utility trenches:

a. Compact each layer of initial and final backfill soil material at 85 percent.

3.18 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge and within +0” / -1” tolerance of bottom of slab.

1. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.19 SUB BASE FOR CONCRETE SLABS-ON-GRADE

A. Place sub base on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact sub base under cast-in-place concrete slabs-on-grade as follows:

1. Place sub base 8 inches or less in compacted thickness in a single layer.
2. Place sub base that exceeds 8 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 8 inches thick or less than 3 inches thick.
3. Compact each layer of sub base to required cross sections and thicknesses to not less than 95 percent of maximum dry density according to ASTM D 4254.

3.20 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections unless otherwise noted.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Inspections and tests:

1. Geotechnical observations: Proof rolling procedures, site preparation, unsuitable soils removal, excavations, footing bearing, and fill placement.

2. Field Density Testing:

a. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Geotechnical Engineer.

b. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1) Fill under Footings: In each compacted fill layer, 1 compaction test for every 30 linear feet of wall may be taken. 1 compaction test may be made under each individual footing.
2) Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 50 feet or less of wall length, but no fewer than two tests.
3) Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
4) Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

c. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3. Laboratory testing for on-site fills:

a. ASTM D 1557 Modified Proctor compaction curve including sieve analysis.

3.21 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Geotechnical Engineer or Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Chain-link fences.
2. Gates: Swing.
3. Privacy Slats

B. Related Sections:

1. Section 03 30 53 “Misc. Cast-in-Place Concrete”
2. Section 31 20 00 "Earth Moving"

1.3 REFERENCES

A. ASTM A392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric.

B. ASTM F552 Standard Terminology Relating to Chain Link Fencing.

C. ASTM F567 Standard Practice for Installation of Chain Link Fence.

D. ASTM F626 Specification for Fence Fittings.

E. ASTM F900 Specification for Industrial and Commercial Swing Gates.

F. ASTM F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

G. ASTM F1184 Specification for Industrial and Commercial Horizontal Slide Gates.

H. CLFMI WLG2445 Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing.

1.4 PERFORMANCE REQUIREMENTS

A. Design Wind Load: Comply with applicable requirements of building code in effect for Project including applicable portions of ASCE 7 for Wind Load Pressure and CLFMI WLG 2445 Wind Load Guide for the Selection of Line Post Spacings.

1.5 SUBMITTALS

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

B. Action Submittals:

1. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

a. Fence and gate posts, rails, and fittings.

b. Chain-link fabric, reinforcements, and attachments.

c. Polymer and polyester coatings.

1) Note: Polymer and polyester coated samples and product data are to be submitted simultaneously.

d. Accessories:

1) Privacy slats

e. Gates and hardware.

2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, and operational clearances.

3. Samples for Verification:

a. Polymer and Polyester Coated Components: In 6-inch lengths for components and on full-sized units for accessories.

1) Note: Polymer and polyester coated samples and product data are to be submitted simultaneously.

b. Manufacturer's color charts.

4. Warranty:

a. Sample of special warranty
b. Sample of manufacturer warranty

C. Informational Submittals:

1. Qualification Data: Submit list of completed projects using products proposed for this Project, including owner's contact and telephone number for each project, demonstrating compliance with "Quality Assurance" article.

2. Product Test Reports: For framing strength according to ASTMF 1043.

D. Closeout Submittals:

1. Operation and Maintenance Data: For the following to include in operation and maintenance manuals:

    a. Polymer and polyester finishes.
    b. Gate hardware.

2. Warranty: Executed special warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Minimum five (5) years' experience in installing chain link fences and gates similar in material, design, and extent to that indicated for this Project in accordance with ASTM F 567, whose work has resulted in construction with a record of successful performance.

B. Mockups: If required by Architect, build mockups to set quality standards for fabrication and installation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.8 WARRANTY

A. Special Warranty: Contractor's warranty to repair or replace components of chain-link fences and gates that fail in materials or workmanship within the specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Failure of any component of fence to perform as designed.
    b. Faulty operation of gate(s) to perform as designed.

2. Warranty Period: Five (5) years from date of Substantial Completion.

B. Manufacturer warranty: Manufacturer's standard form in which Contractor agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Deterioration of metals, metal finishes, coatings and other materials of the fence components, including fabric, framework and fittings.

2. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle. Comply with CLFMI Product Manual and with requirements indicated below:

1. Fabric Height: As indicated on Drawings.

2. Steel Wire Fabric:

a. General Use: Wire with a diameter of 0.148 inch (9 gauge) minimum. For polymer coated fabric, wire with a diameter of 0.148 inch core (9 gauge core) minimum.

3. Mesh Size:

a. General Use: 2 inches, unless noted otherwise.

4. Coatings:

a. Polymer-Coated (Vinyl) Fabric: ASTM F 668, Table 4, Class 2b, fused and adhered over zinc-coated steel wire.

1) Color: **[Black]**, complying with ASTM F 934.

2) Basis of Design Manufacturer: Subject to compliance with requirements, polymer coating that may be incorporated into the Work include, but are not limited to, the following:

a) Merchants Metals Brighton Colorcoat II fused and adhered polymer coating.

5. Selvage: Knuckled at both selvages.

2.2 FRAMEWORK MATERIALS

A. Posts and Rails: Comply with ASTM F 1043 for minimum dimensions and wall thickness of framing, including rails, braces, and line; terminal; and corner posts, meeting the following criteria:

1. Heavy Industrial Strength: ASTM F 1043 Group I-C, SS40, round steel electric-resistance-welded pipe galvanized with hot-dip process in accordance with ASTM A653/A653M and ASTM A924/A924M.

2. Manufactured to meet minimum yield strength of 50,000 psi and coated in accordance with the following standards:

a. ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, heavy industrial weight.

b. M181, Type I, Grade 2, Electrical Resistance Welded Steel Pipe

c. RR-R 191/3, Class 1, Grade B, Electrical Resistance Welded Steel Pipe.

B. Coatings:

1. PVC / Polyester Coating Over Zinc Coating:

a. Thermoplastic vinyl finish to be 10 mils (minimum) thick.

b. Cleaning and Surface Preparation: Consists of a four-stage pretreatment/wash, an iron phosphate coating and immersion in a water based epoxy primer.

c. PVC Coating Application: Coating is thermally fused to heated pipe meeting the following standards:

1) ASTM F1043 Group I-C, Heavy Industrial.
2) Federal specification RR-F-191/3E, Class 1
3) Shows satisfactory adhesion in cross-hatch test, Method B, ASTM D3359.
4) Finish shall not crack, blister or split under normal use.

2. Color: Match chain-link fabric, complying with ASTM F 934, Standard Colors for Polymer-Coated Chain Link Fence Materials.

C. Basis of Design Manufacturer: Subject to compliance with requirements, framework and coatings that may be incorporated into the Work include, but are not limited to, the following:

1. Merchants Metals Colorbond Chain Link Fence Framework and Coating System.

2. Master Halco Permafused II Heavy Mil PVC Chain Link Fence Framework and Coating System.

3. Ameristar PermaCoat PC-40 (industrial weight), manufactured by Ameristar Fence Products (www.ameristarfence.com) Chain Link Fence Framework and Coating System.

2.3 FRAMEWORK SIZES

A. Line Post Size (determined by height):

1.	4 feet up to and including 6 feet high:	2 inches o.d.
2.	7 feet up to and including 9 feet high:	2-1/2 inches o.d.
3.	10 feet up to and including 12 feet high:	3 inches o.d.
4.	Over 12 feet to 16 feet high:	4 inches o.d.

B. End, Corner and Pull Post:

1.	4 feet up to and including 6 feet high:	2-1/2 inches o.d.
2.	7 feet up to and including 9 feet high:	3 inches o.d.
3.	10 feet up to and including 12 feet high:	4 inches o.d.
4.	Over 12 feet to 16 feet high:	4 inches o.d.

C. Horizontal Framework Members: Intermediate, top and bottom rails complying with ASTM F 1043. Size in accordance with the following guidelines unless otherwise indicated on drawings:

1. Top, Intermediate and Bottom Rail: 1.66 inches in diameter.

a. Bottom Rail: Provide bottom rail for:

1) Fence 9 feet high and over

b. Intermediate Rail: Provide intermediate rail for:

1) Fencing 10 feet high and over,

2. Brace Rails: Comply with ASTM F 1043.

2.4 TENSION WIRE

A. Metallic-Coated Steel Wire: For use on fencing with zinc coated fence fabric. 0.177-inch-diameter (7 gauge), marcelled tension wire complying with ASTM A 817 and ASTM A 824, with the following metallic coating:

1. Type II, zinc coated (galvanized) with the following minimum coating weight:

a. Matching chain-link fabric coating weight.

B. Polymer-Coated Steel Wire: For use on fencing with polymer coated fence fabric. 0.177-inch-diameter (7 gauge core), tension wire complying with ASTM F 1664, Class 2b over zinc-coated steel wire.

1. Color: Match chain-link fabric, complying with ASTM F 934.

2.5 FITTINGS

A. General: Comply with ASTM F 626.

B. Post Caps: Provide for each post. Post caps to be weather-tight, securely fastened and vandal-resistant.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.

2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel. Length not less than 2 inches shorter than full height of chain-link fabric with minimum cross-section of 3/16 inch x 3/4 inch. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading. Provide rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:

a. General Use Fencing including Foul Line, Outfield and Tennis Court Fencing:

1) Aluminum: ASTM B 211; Alloy 1350-H19; 0.148-inch-diameter, mill-finished wire. Coating to match chain-link fence fabric. (Provide coating to match framework.)

2. Hog Rings: For attaching chain link fabric to bottom tension wire.

a. Material: Aluminum per ASTM B 211; Alloy 1350-H19; 0.192 inch (6 gauge), mill-finished wire.

I. Fitting Finish:

1. Steel or cast iron: Galvanized Coating for Pressed Steel or Cast Iron - Not less than 1.2 oz. /sq. ft. zinc.

a. Coating - [**Vinyl-coated per ASTM F 626.**] **[Coating to match framework.**]

2. Aluminum: Mill finish with coating to match framework.

3. Color: To match color of fence fabric.

J. Fasteners:

1. Material to be stainless steel.

a. Coating - **[Vinyl-coated per ASTM F 626.] [Coating to match framework.]**

2. Color: To match color of fence fabric.

3. Finish: Install fasteners that are no more than ¼ Inch long.

2.6 SWING GATES

A. General: Comply with ASTM F 900 for gate posts and single and double swing gate types.

1. Gate Leaf Width: 48 inches unless otherwise noted on drawings.

2. Gate Fabric Height: As indicated on drawings.

B. Pipe and Tubing:

1. Coating and finish to match fence framing.

2. Gate Post Size:

a. For gate heights over 6', and if gate height is equal to fence height, then standard fence framing end post requirements shall apply. Refer to Post and Rail requirements.

b. Gate Leaf up to 6 feet Wide: 2.875 inches o.d.; 4.64 lbs./l.f.

c. Gate Leaf over 6 feet and under 12 feet wide: 4 inches o.d.; 6.56 lbs./lin. ft. (weight applicable to Group IC SS40 framework only)

d. Gate Leaf over 12 feet Wide: 6.625 inches o.d.; 19 lbs./lin. ft.; or 4.5 inches o.d. (applicable to Group IC SS40 material complying with ASTM F 1043 only and upon approval of framework material by Architect.)

C. Frame Corner Construction: Welded.

D. Swing Gate Hardware:

1. Hinges: 180-degree inward swing unless otherwise noted on Drawings.

2. Latches: Commercial latch permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.

3. Padlock and Chain: Owner furnished.

4. Keeper: Provide keeper for all vehicular gates, which automatically engages gate leaf and holds it in open position until manually released. Provide sleeve to insert keeper. For concrete paving, set sleeve directly into concrete. For asphalt paving set sleeve into concrete collar.

5. Double Gates: Provide drop bar for all double gates, consisting of hot-dipped galvanized rod that drops into concrete collar. Provide locking device and padlock eyes as an integral part of the latch, requiring one padlock for locking both gate leaves.

6. Closer: Manufacturer's standard.

7. Color: To match fence fabric.

2.7 FENCE POST ROUND CONCRETE FORM

A. **Basis-of-Design Product: Subject to compliance with requirements, provide Sonoco Sonotube Concrete Forms or comparable product.**

Retain one of the two subparagraphs below for privacy slats. PRIVACY SLAT "75% Privacy" will have a cleaner, neater appearance, where "90% Privacy" has more coverage, more privacy.

2.8 PRIVACY SLATS – 75 Percent Coverage

A. Material: Heavy duty polyethylene reinforced flat tubular slats:

1. Provide 75% coverage (Privacy Factor).
2. Slats must span full height of fence (i.e., no partial height slats).
3. Slat Width: 1 3/32" for 2" Mesh Size.
4. Manufactured for chain-link fences from virgin polyethylene containing UV inhibitor.
5. Sized to fit mesh specified with vandal-resistant fasteners and lock strips.
6. Installed vertically.
7. Verify wind-loading is appropriate for fencing specified and application.

B. Color: As selected by Architect from manufacturer's full range.

2.9 CONCRETE

A. Concrete Footings: Refer to Division 03 concrete section for cast-in-place concrete, ASTM F 567 Section 5 and Drawings and Details for footing size. Bottom of footing must not be smaller than the top to prevent frost heaving.

2.10 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 and compatible with galvanized and clear coatings. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications. To be compatible with galvanized and clear coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated.

1. Install fencing on established boundary lines inside property line.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil. Mechanically driven posts only allowed if shown on Drawings or specifically approved by Architect.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

a. Concrete Fill: Minimum 28-day compressive strength 3,000 psi (20 MPa). Refer to Division 03 Section "Cast-in-Place Concrete."

b. Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

C. Types of Post Footings: As indicated on Drawing or as approved by Architect.

1. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.

2. Concealed Concrete: As indicated on Drawings to allow covering with surface material.

3. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.

D. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

E. Line Posts:

1. General Use Fencing: Space line posts uniformly at 10 feet o.c. unless otherwise indicated on Drawings.

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with hog rings spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along bottom of fence fabric. Install bottom within 6 inches of bottom of fabric and tie to each post with tie wires.

H. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps / loop caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps / loop caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer. Connection sleeves to be located / supported by post caps / loop caps.

I. Intermediate and Bottom Rails: Install and secure to posts with fittings.

J. Chain-Link Fabric: Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

1. Height of fabric between finished grade and bottom selvage.

a. General Use: Leave 2 inches between finished grade or surface and bottom of selvage unless otherwise indicated.

2. Fabric installation on fence posts relative to adjacent use:

a. General Use: Apply fabric to inside of enclosing fence posts / framework as indicated on Drawings.

K. Tension or Stretcher Bars: Thread bar through first row of diamonds of fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.

L. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Aluminum ties: Both ends of the tie are to make two complete wraps around wire pickets. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
2. Privacy Slats: Install slats in direction indicated, securely locked in place, vertically.

3.5 FENCE INSTALLATION ADJACENT TO BUILDING WALL OR COLUMN

A. Install fencing and gates with maximum 2” gap between fence post and building wall or column unless otherwise noted.

3.6 SWING GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.7 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain chain-link fences and gates.

3.9 COMPLETION AND CLEAN UP

A. Leave the area of installation free of debris and excess soil, concrete, and gravel resulting from installation of the fence. Clean fencing of concrete slurry, hydroseeding overspray and any other excess material. Seed and mulch all areas around the fencing where bare earth is left exposed.

END OF SECTION 32 31 13

SECTION 32 92 00 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Turf planting soil.
3. Turf planting soil amendments and fertilizers.
4. Turf renovation.
5. Turf.
6. Turf maintenance.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including:

1. Seed.
2. Fertilizer.
3. Imported Topsoil

B. Samples for Verification: For the following products, in sizes or quantities indicated below:

1. Imported Topsoil: One-half gallon by volume of material in sturdy container of each type of topsoil, naming source for each material.

C. Warranty: Sample of special warranty.

1.5 INFORMATIONAL SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

B. Qualification Data: For qualified landscape Installer.

C. Product Certificates: For soil amendments and fertilizers, from manufacturer.

D. Material Test Reports: For imported topsoil.

1. Before delivery of imported topsoil, submit written statement giving location of properties from which topsoil is to be obtained, names and addresses of property owners, topsoil nutritional analysis report per requirements below, depth to be stripped, and any crops grown during the previous 5 years.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

B. Warranty: Executed special warranty.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.

2. Turf Installer: Engage an experienced turf installation firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.

B. Soil Nutritional Analysis Report for Imported Topsoil: Furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; available nutrients; deleterious material; pH and recommendations to obtain optimal pH factor; mineral and nutrient content of the soil.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

1.9 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.

1. Spring Planting: March 15 to May 15.
2. Fall Planting: August 15 to September 15.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.10 SEQUENCING AND REVIEW

A. Notify Architect no fewer than 48 hours in advance of proposed seeding to allow review of topsoil finish grading.

B. Do not proceed with seeding without Architect's written permission.

1. Architect’s written permission does not alleviate Contractor from conforming to the required grades indicated on Drawings.

1.11 MAINTENANCE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, as determined by the Architect, but for not less than the following periods:

1. Seeded Turf: Five (5) documented mowings.

a. Document mowings in writing via fax or email to Owner and Architect on the day each mowing is performed. Failure of notification may subject Contractor to further mowings at no additional cost to Owner.

2. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

B. Water: Provide all water required to properly irrigate temporary, permanent, and renovated turf areas. Include all facilities including, but not limited to, hoses, sprinklers, water cannons and reels, as long as it takes to establish and maintain turf. When adequate water supply or pressure is not available, supply water from offsite, including trucking.

1.12 WARRANTY

A. Special Warranty: Installer agrees to repair or replace turf that fails in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.

2. Warranty Period:

a. Turf: 12 months, after acceptable turf is established, as determined by the Architect.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead turf and replace unless required to plant in the succeeding planting season.
b. Replace with seed as originally specified.

B. Provide extended warranty for period equal to original warranty period, for replaced turf material.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Varieties: Premier varieties of Kentucky bluegrass, perennial ryegrass, tall fescue and fine fescue with a mean ranking of 6.0 or higher on the National Turfgrass Evaluation Program (NTEP) current list of tested varieties for the Northeast United States.

C. Seed Blends: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

1. General Lawn Sun/Shade Mixture: Proportioned by weight as follows:

a. 75 percent 1/3 equal mixture of three Kentucky bluegrass (Poa pratensis) varieties.
b. 25 percent fine fescue (Fescue rubra).

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
2. Provide lime in form of ground dolomitic limestone.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.

2.3 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition, unless otherwise indicated:

1. Spring Fertilization: 10 percent nitrogen, 6 percent available phosphorous, and 2 percent water-soluble potash (10-6-4).
2. Fall Fertilization: 5 percent nitrogen, 10 percent available phosphorous, and 5 percent water-soluble potash (5-10-5).
3. Final Fertilization:

    a. Spring: Granular slow release fertilizer with high nitrogen (38 percent), Uramite or other Architect-approved material.
    b. Fall: “Fall Fertilization” composition above.

4. Follow requirements regarding fertilization recommended in soil reports from a qualified soil-testing laboratory.

2.4 TURF PLANTING SOILS

A. General: Provide turf planting soil consisting of existing and/or imported topsoil with amendments and fertilizers noted in this Section.

1. Where quantities of existing topsoil are insufficient to provide 6 inch depth turf planting soil, supplement with imported topsoil, at no additional cost to Owner.

B. Topsoil Requirements: Free of subsoil, stones 1 inch or larger in any dimension, dense material, hardpan, slag, clay, cinders, sod, roots, sticks, poison ivy, crabgrass, cough grass, noxious weeds, and foreign matter, including but not limited to glass, screws, asbestos, toxins, hazardous wastes, petroleum product contamination, lead and chemicals (such as atrizene and muriatic acid) that may be injurious to humans, animals and plant materials.

1. Topsoil (Existing and Imported) to comply with the following:

    a. Organic Matter Content: Not more than 10 percent.
    b. Corrected to pH Value: 6.5 to 7.5 on that portion passing 1/4-inch sieve.
    c. Soluble Salt Content: Not to exceed 500 parts per million.
    d. No more than 60 percent of material passing #100 mesh shall consist of clay as determined by Bouyoucous hydrometer or by decantation method.

2. Existing Topsoil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify suitability of native surface topsoil to produce viable planting soil.

3. Imported Topsoil: Imported topsoil obtained from local sources or from areas having similar soil characteristics as Project site. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 6 inches deep; do not obtain from agricultural land, bogs or marshes.

   a. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled, pore-space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

   b. Soil Analysis Report: Provide soil analysis and report to demonstrate that the above requirements are being met and to identify if nutritional amendments are needed.

   c. Soil Analysis Recommendations: Provide amendments recommended in the soil analysis report, as approved by Architect.

   d. Mechanically screen imported topsoil to conform to following gradations:

Sieve Designation	Percent Passing
1 inch	100
1/4 inch	97-100
#200	20-65 of the 1/4-inch sieve

C. Required Amendments: Mix existing and imported topsoil with the following soil amendments in the following quantities to produce planting soil:

1. pH Adjustment: Apply approved calcium or sulfur compounds to correct pH level to be between 6.5 and 7.5.

2. Provide fertilizer per “Fertilizer” Article above.

2.5 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.6 EROSION-CONTROL MATERIALS

A. Refer to Section 31 25 00 “Erosion and Sedimentation Controls.”

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

D. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect grade stakes set by others until directed to remove them.

3.3 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Thoroughly blend topsoil with soil amendments and fertilizer.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

b. If liming is required, mix lime with dry soil before mixing fertilizer.

2. Spread planting soil to a depth of 6 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

a. Spread approximately 1/3 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.

C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:

1. Cut neat line between existing turf to remain and new turf.
2. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
3. Loosen surface soil to a depth of at least 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
4. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
5. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Architect's written permission; restore planting areas if topsoil finish grading is eroded or otherwise disturbed after finish grading.

3.4 SEEDING

A. Timing: Provide seeding within planting times indicated.

1. Seed at earliest possible date to achieve mature turf prior to Owner occupancy.

B. Sow seed with Brillion spreader or similar seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in three passes: second pass at 90 degrees to the first, third pass at 45 degrees to second.

1. Do not use wet seed or seed that is moldy or otherwise damaged.
2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

C. Sow seed at a total rate of 6 lb/1,000 sq. ft.

D. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

E. Protect seeded areas with slopes not exceeding 1:4 as follows:

1. In small areas adjacent to buildings, at parking islands and narrow strips of seeding along paving, spread straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment. Avoid areas of thick mulch that will prevent seed determination.

F. Water newly planted areas and keep moist until new turf is established.

3.5 TURF RENOVATION

A. Renovate existing turf indicated on Drawings, turf areas anticipated to be disturbed as part of Project, and areas damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

B. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

C. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

D. Mow, dethatch, core aerate to a minimum depth of 4 inches, and rake existing turf.

E. Remove weeds before seeding.

F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

H. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.

I. Apply seed and protect with straw mulch as required for new turf.

J. Water newly planted areas and keep moist until new turf is established.

3.6 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Use hand weeding to control weeds. Schedule weedings throughout the year to maintain turf as free of weeds as possible.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf when new growth reaches 3.75-4.5 inches in height.. Repeat mowing to maintain specified height once per week or as needed to ensure the maximum height does not exceed 4.5 inches between mowing Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow turf to a height of 2-1/2 to 3 inches.
2. Neatly trim edges and hand clip where necessary.
3. Immediately after each mowing (same day), carefully remove excess clippings to prevent damage to turf.

D. Turf Post fertilization: Apply fertilizer after initial mowing and when grass is dry.

3.7 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

C. Warranty period does not begin until satisfactory turf is established, as determined by the Architect.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 32 92 00